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NATURAL HISTORY

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IN THE WORLD OF PRIMITIVE MAN
BY HENRY FAIRFIELD OSBORN

THE BIRTH OF A SCIENCE
BY WILLIAM HARVEY McNAIRN

NATURE AND THE CITY CHILD
BY MRS. JOHN I. NORTHROP

JOHN C. MERRIAM—THE REDWOODS—WOOD-PULP SHORTAGE—LAFAYETTE NATIONAL PARK—GEORGE W. PERKINS—GARDENS OF BUENOS AIRES—SEA BIRDS—EAGLES OF ALASKA—WILLIAM DUTCHER—THE WATER POWER BILL—NOTES OF MEN AND SCIENCE

JOURNAL OF THE AMERICAN MUSEUM OF NATURAL HISTORY

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Detail of American Museum mural by Charles R. Knight (see page 241). Copyrighted photograph

EVOLUTION'S MOST MAJESTIC CREATION

The woolly mammoth, a contemporary of the Crô-Magnon man in Europe, was a representative of the last Ice age, with an ancestry leading back to a time many hundred thousand years prior to the origin of early man. Through disastrous effects of the Glacial period, and latterly through attacks by his great enemy, man, the elephant's line of evolution is now ended. In fact, it is estimated that the period of the Age of Mammals as a whole will likely have closed by the middle of this century—that is, in but a paltry thirty years from this year 1920, through immediate destruction by man. What of conservation? Where are our adequate national and state animal preserves?

NATURAL HISTORY

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From restorations by J. H. McGregor

TRINIL APE-MAN (*Pithecanthropus erectus*, see page 231) | NEANDERTHAL MAN (*Homo neanderthalensis*, see page 234) | CRÔ-MAGNON MAN (*Homo sapiens*, see page 235)

That these three restorations of prehistoric man form a progressive series, from left to right, is evident not only by the general form and the appearance of relative intelligence appreciated by the most casual observer, but especially by definite anatomical characters such as increased prominence of the chin, reduction of the eyebrow ridges, reduction of the prominence of the lower face as a whole, increased size of skull and of brain capacity (brain capacities of the three races from left to right: 858–900cc.; 1408cc.; 1550–1880cc.)

The Hall of the Age of Man in the American Museum

By HENRY FAIRFIELD OSBORN

FOREWORD.—An important event in the American Museum of Natural History is the approaching completion of the hall of the Age of Man, a sequel to the halls of the Age of Mammals and of the Age of Reptiles. In about two years from the present time this hall will be arranged with all its murals and collections, as the first undertaking of its kind to show the ancestors of man in their environment. Many years of study have been given to the work of arrangement of the hall, which will present a complete picture of the successive stages in the evolution of man, as well as of the splendid types of animals that surrounded him in the infancy of his mental development in various parts of the world. Many experts in various lines have coöperated in this work under the author's direction. Exchanges with the chief museums of the world have been brought together, and fossil gifts of priceless value, the products of years of exploration from the sands of Egypt to the tundras of the Arctic. The purpose is to show the entire environment of man and his ancestors during the last 500,000 years.—THE AUTHOR.

THE beginning of the Age of Man, some 500,000 years ago, roughly estimated as the close of the Age of Mammals, marks in reality but the beginning of the close of the Age of Mammals. The extinction of the most superb mammals that the earth has ever produced, during the early stages of human evolution, progressed from natural causes due directly or indirectly to the Glacial epoch. With the introduction of firearms the destruction has proceeded with increasing rapidity, and today it is going on, by the use of guns and steel traps, at a more rapid rate than ever. By the

middle of this century man will be alone amid the ruins of the mammalian world he has destroyed, the period of the Age of Mammals will have entirely closed, and the Age of Man will have reached a numerical climax, from which some statisticians believe it will probably recede, because we are approaching the point of the overpopulation of the earth in three of the five great continents.

The Ascent of Man

The cradle of the human race was, in our opinion, in Asia, in regions not yet explored by palæontologists. One reason that human and prehuman fossil remains are rare is that the ancestors of man lived partly among the trees and forests; this does not mean that they were arboreal; they lived chiefly on the ground. Even when living in a more open country the ancestors of man were alert to escape the floods and sandstorms which entombed animals like the horse of the open country and of the plains. Hence fossil remains of man as well as of his ancestors are extremely rare until the period of burial began. Only two races, the Heidelberg and the Piltdown, are certainly known from the river drifts and gravels before the period of burials.

The human remains known consist principally of portions of skulls, of jaws, and teeth of members of these races. Individuals are now represented by casts in the hall of the Age of Man. The museum series began in 1915 with the gift of the J. Leon Williams Collection, and has been enriched by additions from the museums of London, Paris, and recently of the Neanderthal man of Krapina, presented by Professor K. Gorjanovič-Kramberger, also the skull of Talgai, of South Africa, presented by Dr. Stewart A. Smith.

Man as a Primate

The ascent of man as one of the Primates was parallel with that of the families of apes. Man has a long line of ancestry of his own, perhaps two million or more years in length. He is not descended from any known form of ape either living or fossil. One hypothetical ancestral stage, of which we have a small jaw (see middle bottom of exhibit in Case I, opposite page) found in the Oligocene of northern Egypt, is the *Propliopithecus,* which in the opinion of Professor W. K. Gregory, of the American Museum, our leading authority on the anthropoids, is at least structurally ancestral to the higher apes and man—in other words a possible prehuman link. From such an animal possibly four branches were given off leading respectively to the living orangs, the gibbons, the chimpanzees, the gorillas, and some of their fossil ancestors.

All these great man apes are distinguished from man by being more or less arboreal in habit; they are shown to be very far removed from the large-brained walking line which gave rise to our ancestors. Our own immediate ancestors did not live in trees; they were erect or semi-erect for a very long period, perhaps as far back as Miocene time. Back of this, perhaps a million years ago, was a prehuman, arboreal stage.

The Trinil ape-man, the *Pithecanthropus* of Java (see center of Case I) is the first of the conundrums in human ancestry. Is the Trinil race prehuman or not? The restored head by Professor J. Howard McGregor, of Columbia University, is designed to show its half human, half anthropoid resemblance, as suggested by the top of the cranium, the only part known, which is far more human than that of any ape cranium, and at the same time far more apelike than that of any human cranium. It is not impossible that this ape-man is related to the Neanderthal man (skull shown in Case 3, page 234).

In this exhibit of the great man apes

MAN'S PLACE AMONG THE PRIMATES

Photograph of Case I in the hall of the Age of Man, the American Museum, showing the "Trinil race" of Java and other primates, living or extinct, which aid in reconstructing the ancestral tree of the human race

In the right half of this case are arranged the skulls of certain anthropoid apes—gibbon (1), orang (2), chimpanzee (3), adult gorilla (4), young gorilla (5), while on the left are models of skulls of the known races of man—Piltdown (7), Neanderthal (8), Talgai (9), Crô-Magnon (10), recent (11). Between these two groups have been placed a restoration of the skull and of the head of the "Trinil" or ape-man of Java (*Pithecanthropus erectus*) and a cast of the actually discovered brain case and two of the teeth (6, 6, 6).

The ascent of man has in general paralleled that of the families of anthropoid apes, as is shown by the "tree of descent" in black lines. Man is not descended from any known ape, either living or fossil, but a hypothetical ancestor of this entire anthropoid group, founded on a jaw discovered in Egypt (see cast at bottom center), is the *Propliopithecus haeckeli*. The case is ruled horizontally to indicate five periods (the most ancient, at the bottom, does not show in the photograph) of geological time (Eocene, Oligocene, Miocene, Pliocene, and Pleistocene), and below the recent apes are placed casts of the jaws or teeth of certain fossil apes, which have been discovered in deposits of these different geological periods.

On the human side of the case, immediately below No. 8, the Neanderthal skull, is shown a cast of the massive Heidelberg jaw (sown also in Case II, No. 7, page 233), representing a race which was perhaps the predecessor of Neanderthal man in Europe. Below this and on another branch are casts of teeth and fragments of jaw of a primitive fossil ape of India (*Sivapithecus indicus*), the patterns of whose molar teeth somewhat resemble those of man, but still more those of the orang. The card on the base line just left of the middle bears the drawing of the jaw with teeth of a fossil primate, *Parapithecus*, from Egypt, the most primitive of all known Old World monkeys and apes and considered to be the Oligocene survivor of an ancient type ancestral to the ancient *Propliopithecus haeckeli*

(at the left in Case I) are placed for comparison some of the known extinct or fossil races of man, each ascending along a line of its own. Copies of the most recent discoveries in various parts of the world are placed in this series; in fact, this entire exhibit is designed to show from time to time our progress in discovery, to present actual evidence in place of theories and speculations, and to show how very limited this evidence is as compared with the abundant evidence in the ancestry, for example, of the horse (shown in the hall of the Age of Mammals).

The Most Ancient Human Races, Heidelberg and Piltdown

Unquestionably the most ancient human relic which has thus far been discovered is the jaw (see reproduction in Case II, left) of the so-called Heidelberg man, a fossil which may be 250,000 years old. From it has been modeled by McGregor the Heidelberg skull, which is very similar to the Neanderthal skull. The Heidelberg man may be ancestral to the Neanderthal man (shown in Case III, page 234).

A few deep brown fragments of a skull and jaw and one tooth (see casts in Case II, at the right) represent all the remains known of the Piltdown man, discovered in England a few years ago. Two reconstructions of the Piltdown skull have been made; the original by Professor A. Smith Woodward in London, in the British Museum, the second in this country by McGregor. The problem whether the Piltdown jaw belongs to this human skull or whether it belongs to a fossil chimpanzee is still not actually settled. The skull itself is of a rather fine type, with a flat forehead like that of the existing Bushmen of South Africa.

The Neanderthal Race, the Missing Link

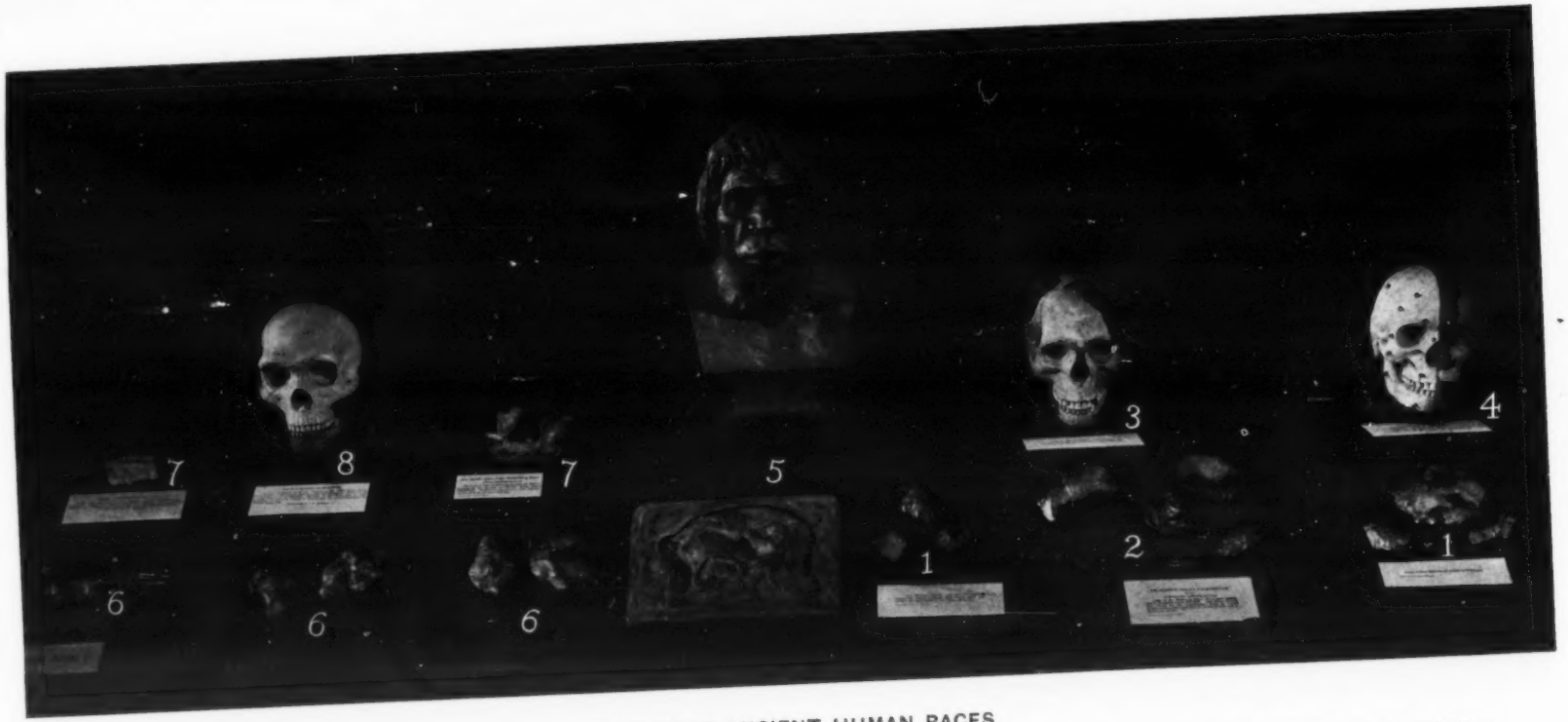
The Neanderthal man represents the oldest fossil human race of which the skeleton is fully known. The remains are relatively abundant, and the American Museum owns reproductions of many skulls and parts of skulls found during the last half century in Spain, Germany, France, and Hungary. Foremost of these is the skullcap found near Düsseldorf, Germany, in 1856, which constitutes the type of the Neanderthal race itself.

Of great interest is the reconstruction by McGregor of a Neanderthal female head, based upon a skull found at Gibraltar in 1848, which gives us the head characters of the women of this very primitive race. All the remains discovered of the Neanderthal men are represented by reproductions in the American Museum excepting one, that of La Quina, France, which has just been presented by the United States National Museum.

Foremost in perfection is the skull from La Chapelle-aux-Saints, originally restored by Professor Marcellin Boule and reconstructed by McGregor. The latter distinguished American expert in the anatomy of palæolithic man is now engaged upon the reconstruction of the entire skeleton and body of the Neanderthal man. We may predict that this life-size Neanderthal model will be one of the most interesting exhibits in the American Museum when the work is finally completed after the many years of laborious study and research put upon it.

The Neanderthal Flint Workers (Mural I)

The mural of the Neanderthal group of flint workers shows in the distance, along the Dordogne River, herds of woolly rhinoceroses and woolly mammoths. The center of interest is the flint industry, which, with the chase, occupied the entire energy of the Neanderthals. This group awaits the completion of the Neanderthal body restoration by McGregor. Since the Neanderthal type is totally different



THE MOST ANCIENT HUMAN RACES

Photograph of Case II in the hall of the Age of Man, the American Museum, showing the Heidelberg and the Piltdown man of the early part of the Old Stone age in Europe, from before 100,000 B.C. to about 45,000 B.C.

The most ancient fossil relic of man is the massive jaw (7, just left of center) which was found near Heidelberg in deposits of the second Interglacial stage, perhaps as early as 200,000 B.C. A skull (8) has been modeled to fit this jaw by Professor McGregor. Of this skull the upper dental arch, the region of the cheeks, and the jaw articulations can be restored with a high degree of probability. The size of the brain case is more doubtful, but it was probably at least of the type of the Neanderthal skull (see page 234). The jaw is of truly remarkable size and strength and entirely apelike in form, especially in the absence of a chin, but the teeth are altogether human and small as compared with the size of the jaw.

Of very great antiquity, perhaps of 500,000 B.C., are the fragments of a skull (2) discovered at Piltdown, England, in conjunction with a number of flints and fossils—and a jaw which is still a matter of controversy. The skull and head of this Piltdown man have been restored by Professor McGregor (3, 4, 5). Number 4 shows a preliminary stage in the restoration of the soft parts of the head with clay cylinders attached to indicate the thickness of the flesh. Number 1, near the center of the case, shows casts of two eoliths, the most primitive form of rude stone implement and a primitive Palæolithic flint implement found in strata immediately above and around the fragments of the Piltdown skull; at 1, near the end of the case, are other flint implements found at Piltdown. Numbers 6, 6, 6 mark a collection of very primitive stone implements rudely edged or pointed. A feature of the Piltdown skull which distinguishes it from those of the Neanderthal type is the absence of eyebrow ridges. Although this is the most primitive and apelike human skull that has been found, it is nevertheless well advanced along the line of characteristically human evolution and shows a brain capacity estimated as at least between 1200 and 1300 cc., equaling or exceeding that of the aboriginal Australians

THE IMMEDIATE PREDECESSOR OF MODERN MAN, THE NEANDERTHAL RACE

Photograph of Case III in the hall of the Age of Man, the American Museum, showing man of the Neanderthal type, in the Middle Old Stone age in Europe, from about 50,000 to 25,000 B. C. (Mural I of the human series, in the hall of the Age of Man, "The Neanderthal Flint Workers," is incomplete and a photograph cannot be presented at this time. The completion awaits the restoration studies, by McGregor, of the Neanderthal body.)

A race of long-headed men was established over western Europe before the last (fourth) Glacial period. Many of their stations have been discovered and a considerable abundance of fossil material, including practically complete skeletons. These represent what is probably a distinct species of man (*Homo neanderthalensis*), presenting some features never before found elsewhere combined in any human race and some quite outside the limits of variation of recent man. Number 1 marks a cast of the skullcap which constitutes the type of this species. The original was discovered in the Neander Valley, near Düsseldorf, Germany, in 1856; at 2 (upper) is a cast of a Neanderthal-like skull discovered at Spy, Belgium; while below this (2, lower) are casts of fragments of jaws from Malarnaud, France. Fragments of very ancient jaws from Krapina, Croatia, are shown in No. 3. These last date from the last Interglacial stage and represent a culture (Acheulean) which preceded the culture (Mousterian) of the typical Neanderthals. The skull found at Le Moustier (France) (4) is thought to be that of a youth of about sixteen years. Number 5 is a cast of a Neaderthal skull from La Chapelle-aux-Saints (France) with the superficial injuries corrected and the nasal bones, alveolar region, and the teeth restored. The three casts numbered 7 are respectively, from left to right, the female Neanderthal skull found at Gibraltar in 1848, a restoration of the same, and a reconstruction of half of the soft parts of the head. The lower jaw was restored from studies of ten other Neanderthal jaws. Number 8 shows stone implements of the so-called *coups de poing* type. The ovaloid forms with sharp edges may have served for knives, while the disk-shaped stone was probably a scraper. To the right of these implements are casts of twelve teeth discovered in 1910 on the Isle of Jersey in the English Channel. The central bust (6) is a restoration modeled by Professor McGregor on a replica of the Neanderthal skull by its side (5)

Painted by Charles R. Knight, under the direction of Henry Fairfield Osborn. Copyrighted photograph

CRÔ-MAGNON ARTISTS OF SOUTHERN FRANCE (MURAL II)

The work of arrangement is in progress on Case IV in the hall of the Age of Man, but is too incomplete to allow presentation of a photograph. Case IV will show the Crô-Magnon race at the climax of the Old Stone age. The mural of the Crô-Magnon artists, however, in the middle of the north wall, is completed, as shown above

Contemporaneously with the disappearance of the last Glacial period in Europe, a highly evolved race in no respect inferior to modern man entered that continent from the east and drove out or exterminated the Neanderthal race, of which they were both the mental and physical superiors. Their cultural capacity is indicated not alone by their physiognomy and the cubic content of their brain (see bust at the right on page 229), but has also been demonstrated by the handiwork and especially the artistic productions which they have left in the caves of southern Europe. The Palæolithic murals and sculptures in relief found on the walls of limestone grottoes in France and Spain indicate greater artistic sense and ability than have been found among any other uncivilized people. The mural above, painted by Knight for the hall of the Age of Man, represents four Crô-Magnon artists at work on the famous procession of mammoths as found in the cave of Font-de-Gaume, Dordogne, France. The two half-kneeling figures are holding lamps made of hollowed-out stones. The artist standing half erect is engaged in incising the outlines of a mammoth on the limestone wall with a sharp flint; the other artist is laying on the colors, employing a shoulder bone for a pallet. The kneeling figure is preparing colors from red or yellow ochre. The clothed man to the left is a chieftain who carries a *baton de commandement* on his staff as an insignia of his rank

from any modern human type, it must be studied from models of its own. The group is very carefully arranged to show the physical characters of this man: the knees slightly bent in the peculiar standing posture, the broad heavy shoulders slightly stooped, and the massive neck and the head set well forward. In the background is the famous cavern of Le Moustier which gives its name to the Mousterian period of flint industry pursued by the Neanderthals.

The Crô-Magnon Race of High Type

The highly evolved Crô-Magnon race entered Europe from the east and drove out the Neanderthals. This was a race of warriors, of hunters, of painters and sculptors far superior to any of their predecessors. The original type of the Crô-Magnon head belonged to an aged individual. We are now endeavoring to secure from France replicas of the Crô-Magnon skeletons buried in the grottoes of Grimaldi near Mentone, which are by far the most perfect known. The contrast between the Crô-Magnon heads and those of the Neanderthals which precede them is as wide as it possibly could be. The Crô-Magnons were people like ourselves in point of evolution, and the characters of the head and cranium reflect their moral and spiritual potentiality.

Crô-Magnon Artists Painting the Mammoth (Mural II)

One of the great murals in the hall of the Age of Man (over the doorway opposite the Crô-Magnon exhibit) represents four of the Crô-Magnon artists actually painting the great fresco in the cave of Font-de-Gaume, Dordogne, France. The writer has been studying the composition of this group for years, with Mr. Charles R. Knight, artist, aided by advice of the Abbé Henri Breuil of the Institut de Paléontologie Humaine, Paris, as well as of Mr. N. C. Nelson, archæologist at the American Museum of Natural History.

There are six figures in the group; four are depicted partly nude to show their anatomy in contrast with that of the Neanderthals. The two half-kneeling figures are holding up small lamps to illuminate the smooth surface of the limestone wall on which the procession of mammoths is being depicted. The half-erect figure represents an artist with pointed flint incising the outlines of a mammoth on the wall. The fully erect central figure represents an artist laying on the colors. A kneeling figure is preparing the colors on a rock. The artists and their assistants have laid off part of their fur clothing in order to work more freely. This design enables the painter to show the tall, slender proportions of the men of this Crô-Magnon race. The standing figure to the left is that of a chieftain clothed in well-made fur garments, who carries on top of his staff his *baton de commandement* as the insignia of his rank. The only illumination is that of the flickering wicks in the small oil lamps.

Men of the New Stone Age

Men of the Neolithic, or New Stone age (see remains shown in Case V, the arrangement of which, however, is only in progress so that a photograph cannot be presented) used stone implements, partly chipped, partly polished. They hunted with the wolf dog. They brought in pottery. In central and southern France and in Switzerland they cultivated the ground and introduced cereals. Forerunners of these Neolithic men scattered over the Baltic shores and reached northern France.

The Neolithic Stag Hunters (Mural III)

This mural group also is in its place in the hall (at the west end), having been completed in 1919. It represents men of a northern race,

Painted by Charles R. Knight, under the direction of Henry Fairfield Osborn. Copyrighted photograph

"THE NEOLITHIC STAG HUNTERS," OF THE NEW STONE AGE (MURAL III)

Case V, in the hall of the Age of Man, illustrating the types and culture of the men of the New Stone age, is in process of arrangement and cannot yet be photographed

The progenitors of contemporary man in Europe, through a transition period between Palæolithic and Neolithic times (about 7000–1500 B.C.), introduced a new culture of polished stone and crude pottery, and either absorbed or displaced their upper Palæolithic predecessors. This mural, "The Neolithic Stag Hunters," now in place in the American Museum, at the middle of the west wall of the hall of the Age of Man, portrays the end of the hunt at an encampment on the border of one of the northern beech forests. The hunters with their stone-tipped spears are resting after the chase and have thrown aside parts of their fur garments. These Neolithic invaders were a powerfully built people with brown or fair hair and narrow heads—closely related to existing peoples of Scandinavia. The rigorous climate little encouraged the fine arts, but promoted endurance, tribal loyalty, and the rudiments of family life. Rude huts were constructed to take the place of caverns and shelters, but the most important cultural change was the introduction of a rudimentary agriculture with the use of a variety of plants and seeds. The men of the New Stone age also brought with them, or domesticated from the animals they found in western Europe, many of the same types of animals as are domesticated today, and they may possibly have been attracted to Europe by the abundance of horses of the forest and Celtic types. The chief's fair-haired son in the picture is shown leading a wolf dog, the ancestor of the sheep dog of northern France

brown- or fair-haired, hunters of the stag, living along the southern shores of the Baltic in the earliest stage of the New Stone age, a stage known as the Campignian from remains of huts and rudely polished stone implements found near Campigny in France. The scene is on the border of one of the northern beech forests and represents the return from the hunt. After the ardor of the chase the hunters have thrown off their fur garments. The chieftain in the center is partly clad in furs; in the coming winter season he will be wholly fur-clad. His son, a fair-haired youth with a necklace of bear claws, grasps a bow and arrow and holds in leash a wolf dog, ancestor of the modern sheep dog of northern France. The hunters, with spears tipped with stone heads, are resting from the chase. Two vessels of pottery indicate the introduction of the new ceramic art, accompanied by crude ornamentation.

This race was courageous, warlike, hardy, but of a lower intelligence and artistic order than the Crô-Magnons; it was chiefly concerned, in a rigorous northern climate, with the struggle for existence, in which the qualities of endurance, tribal loyalty, and the rudiments of family life were being cultivated. Rude huts take the place of caverns and shelters, which are now mostly abandoned.

These were tall men with high, narrow skulls, related to the existing Nordic race, more powerful in build than the people of the Swiss Lake Dwellings. Skulls and skeletons representative of this hardy northern type are abundantly known in Scandinavia, but have not found their way to our American Museum collections as yet.

The Great Mammals Hunted by Man

The hall of the Age of Man is planned to contain four chief collections of the mammals of the world during the period of the Age of Man.

In Europe man hunted the reindeer, the wild horses and cattle, and the mammoth. He used the hide of the reindeer for clothing, the flesh and marrow for food. He carved the ivory tusks of the mammoth. The mammoth, the northern, hairy type of elephant known to early explorers of fossil remains, was foremost among the great mammals hunted by man. The whole history of this proboscidean order is shown in the hall of the Age of Man.

The evolution of the proboscideans culminates in the mastodons and mammoths. This is one of the romances of evolution quite equal in interest to the evolution of the horse. This collection is by far the most complete in existence; it contains as much in the way of complete skeletons as those in all the other museums of the world combined. The early stages in the evolution of the proboscideans, beginning with the *Palæomastodon* discovered in the Fayûm region of northern Africa, carry us back into times far antecedent to the Age of Man, namely, into an early period of the Age of Mammals, the Oligocene. It has been deemed wise to collect here the entire history of the evolution of the proboscideans, which taken altogether is the most majestic line of evolution that has thus far been discovered.

Murals of the Four Seasons in the Glacial Epoch

The four great murals just completed on the north walls of the hall of the Age of Man represent scenes during the four seasons of the year near the close of the Glacial epoch in the Northern Hemisphere.

These four seasons belong in the same period of geologic time, namely, the final glacial stage, the period of the maximum advance of the glaciers over the entire Northern Hemisphere, of the most intense cold, and of the farthest southward extension of the northern types of mammals. This is

Painted by Charles R. Knight, under the direction of Henry Fairfield Osborn. Copyrighted photograph

THE WOOLLY RHINOCEROS IN A GLACIAL WINTER, NORTHERN FRANCE

This mural from the hall of the Age of Man, the American Museum (on the west wall, at the right), and the three following (pages 241 and 245), represent the four seasons of the year in the Old Stone age, near the close of the fourth Glacial period. This was the period of greatest glacial advance over the Northern Hemisphere and of the most southerly extension of the northern types of mammals; it was the time of the Crô-Magnons in Europe from whose paintings we derive knowledge of the mammoth, reindeer, and rhinoceros which then flourished

The most common of the many extinct rhinoceroses is the *Rhinoceros antiquitatis* or woolly rhinoceros of Europe and Siberia. This species was most like the square-mouthed or white rhinoceros of Africa nearly extinct today. It was protected from the wintry blasts by a heavy coat of long hair and a thick undercoat of fine wool. This brown wool was found in a good state of preservation on the side of the face of one specimen discovered in the ice fields of Siberia, and is now in the Museum of Petrograd. In the distance can be seen a group of mammoths and a line of saigas—an extinct species of antelope. The rhinoceros kept closely to the ice sheet and never wandered so far south as did the mammoth. It was a plains dweller, living on grass and small herbs

the time of the Crô-Magnon race, and our knowledge of the mammoths, reindeer, and rhinoceroses is derived from the actual Crô-Magnon paintings and etchings, chiefly those found within the caverns. The murals of the four seasons are as follows:

Midwinter.—The woolly rhinoceros in northern France.

Early Spring.—The reindeer and mammoth on the river Somme, France.

Midsummer.—The mastodon, royal bison, and horse on the Missouri River, in the latitude of Kansas.

Autumn.—The deer-moose, tapir, and giant beaver, in northern New Jersey.

The Glacial Winter in Northern France

The woolly rhinoceros, like the woolly mammoth, was heavily enwrapped in hair, beneath which was a thick coat of fine wool. With this protection the animal was quite indifferent to the wintry blasts which swept over the steppe-like country of northern France. This golden brown wool is actually preserved on the side of the face of one specimen discovered, which is now in the Museum of Petrograd. The head of the rhinoceros was long and narrow, like that of the white rhinoceros of Africa, but the jaws were narrower and the upper lips were more pointed. It is an animal quite distinct from the great black rhinoceros still extant in Africa, which is a grazer with broad lips. In the distance in the painting are shown the saigas, antelopes which wandered over France at that time, and a group of woolly mammoths.

Spring on the Somme River in Northern France

The scene represents the two herds, reindeer and mammoth, migrating along the banks of the river Somme not far from one of the great encampments of men of the Crô-Magnon race. These reindeer and mammoths are, in fact, depicted very precisely in the paintings and engravings left by the Crô-Magnon artists—especially in the cavern of Font-de-Gaume. It is a striking fact that, in the case of the mammoth, every painting, drawing, etching, and model which the Crô-Magnon man has given us exhibits exactly the same characters: the long hairy covering, the very high hump above the forehead, the notch between the hump and the neck, the very high shoulders, the short back, the rapid slope of the back over the hind quarters, the short tail. There is no doubt that aided by these wonderful Palæolithic designs, the artist, Mr. Knight, has given us a very close representation of the actual appearance of the woolly mammoth.

Summer on the Missouri

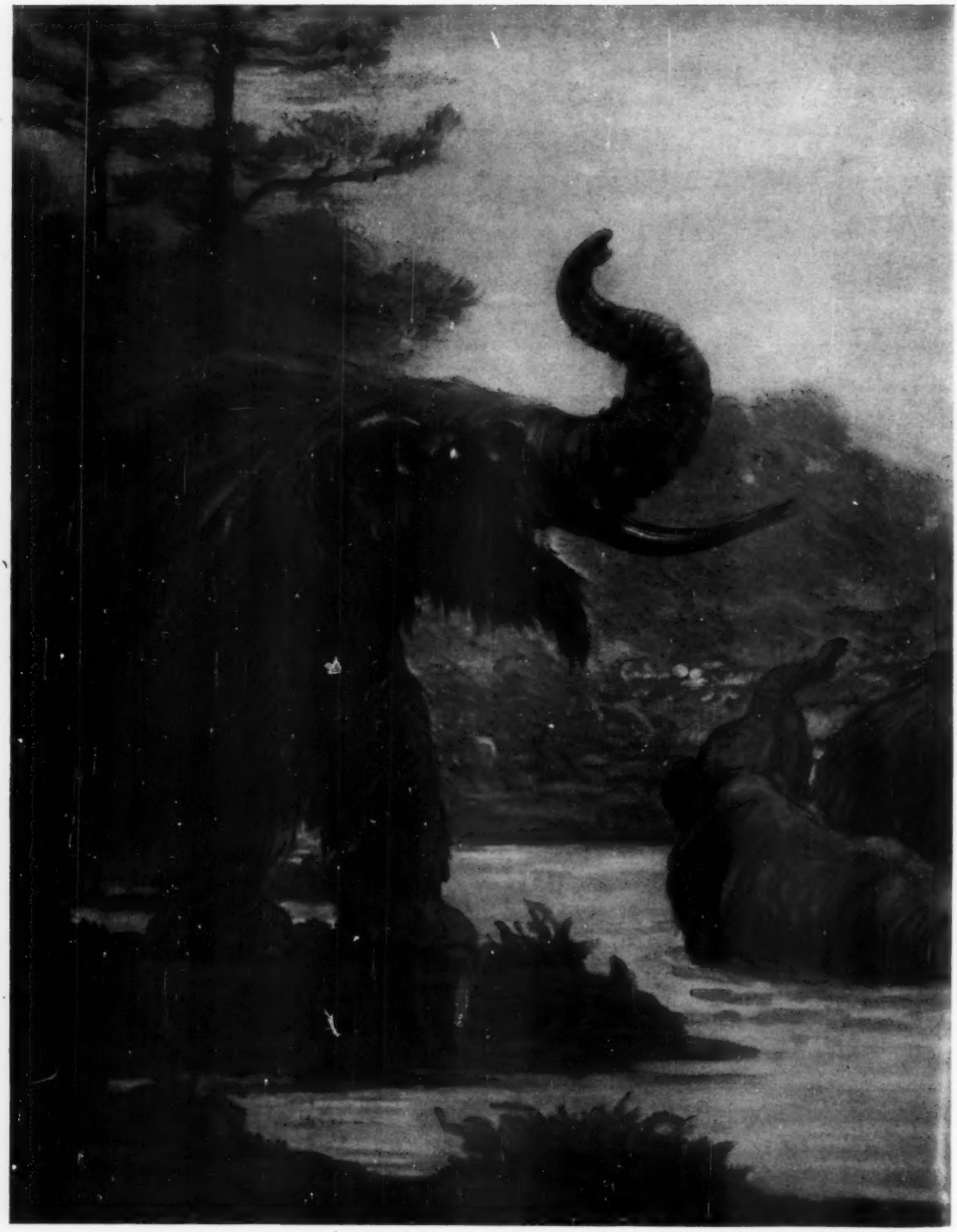
The summer scene on the Missouri River (on the parallel of Kansas) represents the region south of the farthest advance of the ice sheet. The mastodons are grouped in such a manner as to show the characteristic low, flattened head, the long low back, the symmetrical fore and hind quarters, the extremely short, massive limbs, and the very broad and massive hip region as seen from behind. In the center of the picture stands the majestic *Bison regius,* the royal bison, known only from a skull, a superb specimen, with the horn cores attached, in the collection of the American Museum. These animals were like gigantic buffalo or bison, beside which the modern buffalo would appear very diminutive. The characters of the hair and wool are not known, but it is assumed that they were similar to those of the existing buffalo, since the paintings of the bison by the Crô-Magnon artists in France all show the distinctive beard below the chin. At the right is a group of wild American horses of the period, the last of their race in this country; the

Painted by Charles R. Knight, under the direction of Henry Fairfield Osborn. Copyrighted photograph

Early spring—"The Reindeer and Mammoth on the River Somme, France" (mural on the north wall, at the left).—It is thought not improbable that herds of mammoths, rhinoceroses, and reindeer migrated northward and southward with the seasonal changes. This mural represents a northward march in the spring. As the mammoth was faithfully depicted by the Crô-Magnon artists—especially in the cavern at Font-de-Gaume (see page 235), and as mammoth skeletons have been well preserved, there can be little doubt that the present representation by Knight is a close likeness of this huge proboscidean. The woolly mammoth resembled greatly an Indian elephant but was somewhat larger, was covered with coarser hair, and had larger and differently curved tusks. Whole carcasses of these beasts have been found frozen in the ice fields of Siberia where they probably survived later than in Europe

Painted by Charles R. Knight, under the direction of Henry Fairfield Osborn. Copyrighted photograph

Midsummer—"The Mastodon, Royal Bison, and Horse on the Missouri River, in the Latitude of Kansas" (mural on the north wall, at the right).—This mural presents a summer scene in a region of North America south of the farthest advance of the ice sheet. The great mastodon (left) with flat, elongated head and extremely short massive legs survived in America to a time contemporary with man in Europe, but no mastodons lived in Europe at such a late period. In the center of the picture are seen the royal bison (*Bison regius*), the gigantic forerunners of our present bison. At the right is a group of the last species of native American horse (*Equus scotti*) which disappeared before the appearance of man on the North American continent



Detail of American Museum mural by Charles R. Knight. Copyrighted photograph

A MASTODON PORTRAIT

The short-legged, flat-headed mastodon is strongly contrasted in form with the mammoth (compare in the murals on the preceding page). The proboscidean collection in the American Museum is the most complete in existence. It shows that the story of development of this majestic and intelligent line of mammals is one of the romances of evolution, comparable with the evolution of the horse. The earliest elephant ancestry, beginning with the Fayûm *Palæomastodon* discovered in northern Africa, leads to a time greatly preceding the Age of Man, far back at the beginning of the Age of Mammals

Detail of American Museum mural by Charles R. Knight. Copyrighted photograph

PORTRAIT OF A MONARCH OF AN EXTINCT RACE

The "royal bison" (*Bison regius*) ranged the plains of America at the time of the last Glacial period and the Old Stone age of man. The species is known only from a skull in the American Museum.

The half-tone reproductions accompanying this article have had to be so greatly reduced that they give no idea of the impressiveness of the murals in the hall of the Age of Man as a result of their stupendous size. Each of those shown on page 241, for instance, measures in the original wall painting nearly 30 feet in length and 10 feet in width. Also, the reproductions are inadequate because of the failure to carry the beauty of color of the originals and the impressiveness due to the artist's successful handling of light in connection with landscape and animals. The four seasonal murals on the north walls are unified by a noticeable blending in atmosphere from the cold, bleak coloring of winter, through early spring with the glow of a low sun over snow and rocks, into the green and brown of summer, thence into the warm, rich foliage and reflections of autumn

species is *Equus scotti,* the skeleton of which has been discovered in northern Texas.

Autumn in New Jersey

The autumn scene in northern New Jersey embraces three very distinctive North American types of the period, all of which have become extinct. The deer-moose (*Cervalces*) (to the left) was described by Professor W. B. Scott, of Princeton, from a single skeleton found in the gravel beds of northern New Jersey, which is now preserved complete in the Princeton Museum. The American fossil tapir (in the center) is known from sparse remains, the best of which were among the earliest discoveries of the pioneers of American palæontology. The giant, beaver-like animals of the genus *Castoroides* (see two individuals at the right in the painting) are known from nearly complete skulls and skeletons discovered in Ohio and other central western states. They are not true giant beaver.

The remaining mural of this series will represent a scene in southern California, in the vicinity of the Rancho-la-Brea deposits, including the remains of the astonishing group of animals caught in the asphalt trap, so splendidly represented in the collection of the Museum of History, Science, and Art, of Los Angeles.

Closely Related North and South American Mammals of the Glacial Epoch

The most characteristic animals of North and South America that lived during the Age of Man (see the south side of the hall) are known through some of the unique remains from the famous deposits of Rancho-la-Brea of southern California, especially the sloths, saber-toothed tigers, and wolves of the period—to which it is hoped that we may add some of the less abundant forms, like the camel and the horse. So far as possible, through exploration and exchange, this quarter section of the hall will represent the mammalian life of North America, in contrast with the mammalian life of South America during the same period of time.

The Museum is also extraordinarily rich in the great Pampean Collection presented by certain of the trustees in 1899. This collection shows the close connections between North and South America in glacial times.

One of the most wonderful fossil groups in the Museum, if not the most wonderful, is the sloth and glyptodont group (center of southern side of the hall of the Age of Man). This group is still in preparation. It includes five sloths of two varieties (the *Mylodon* and *Scelidotherium*) and three glyptodonts. These animals, so entirely different in external appearance and habits, nevertheless belong to the same order of mammals, the Edentata, which, as its name implies, is distinguished by the absence of enamel on the teeth. It is important to bring these two animals together in the same exhibit, so as to show the very wide contrasts in adaptation which may occur within the limits of a single mammalian order: the sloths covered with long hair and with vestiges of armature embedded in the skin, the glyptodonts nearly hairless, and encased in powerful bony armature, which renders them completely immune to attack by the saber-toothed tiger of the period.

A Loess Storm on the Pampas of Argentina

A mural on the western wall (at the left) of the hall of the Age of Man presents a South American scene during the Old Stone age. It depicts the ancient pampas of Argentina with the winding river La Plata in the background, and a typical extinct mammalian fauna. See page 246 for these animals, which furnish a key to the arrangement of the sloth-glyptodont group described above.

Painted by Charles R. Knight, under the direction of Henry Fairfield Osborn. Copyrighted photograph

AUTUMN IN NORTHERN NEW JERSEY DURING LATE GLACIAL TIMES

This mural (on the east wall, at the left) presents three extinct North American animals: the deer-moose or *Cervalces* (at the left), the tapir (center), and a great rodent, *Castoroides* (on the right). The rodent, much larger than a beaver, dwelt in the northern swamps. Its nearest relative is a large coypu rat of South America. The *Cervalces* had antlers neither as branching as those of the elk nor as flattened as those of the moose. An almost complete skeleton has been recovered from the gravel beds of New Jersey. Tapirs were at one time widely distributed, particularly over the Northern Hemisphere, but are now found only in restricted and widely separated more southerly regions.

The mammalian life of North America, as contrasted with that of South America during the same period of time, will be illustrated in a section of the hall of the Age of Man. The most characteristic animals of this Age—sloths, saber-toothed tigers, wolves, camels, and horses—have been taken from the deposits of Rancho-la-Brea in southern California, where they were caught and preserved in the asphalt quagmires

Painted by Charles R. Knight, under the direction of Henry Fairfield Osborn. Copyrighted photograph

A LOESS STORM ON THE PAMPAS OF ARGENTINA

A mural of South American mammalian life of the Old Stone age, in the hall of the Age of Man (on the west wall at the left)

In the distance a violent storm is transporting columns of loess or fine dust (of which extensive fossil-bearing deposits are found in various parts of the world). The scene is laid along the banks of the La Plata River where many great fossils have been discovered buried in the loess. In the foreground are two very different extinct species of edentates, a family which includes the armadillo, anteater, and sloth. Those with armor at the right are glyptodonts; the long-haired ones at the left are mylodonts. In the background at the right are shown a number of macrauchenias, a three-toed, hoofed animal, while at the left are seen the rodent-like toxodonts, ungulates or hoofed animals also but as large as rhinoceroses. The American Museum has an unusually fine fossil collection from the Pampas, showing the close connection between North and South America in glacial times

The Birth of a Science

Recognition of the similarity of geological processes in the past with those we now see in action, and an evolutionary conception of the earth's history, are leading the human mind into realms of philosophy heretofore undreamed of and revealing secrets which seemed eternally hidden

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I

AFTER speculating upon the probable origin of the world it was but natural that men should ask whether it has remained the same from the beginning, or whether, like everything else we see, it too has been subject to the dominion of unceasing change. What is human history but a record of the rise of empires, their brief tenure of power and eventual fall into insignificance or nothingness? Is it possible, then, that the old earth has experienced similar vicissitudes, that mountain and fertile plain have alike risen from beneath the waste of waters, and that continents upon which flourished the civilization of ancient races have long since been submerged?

What the answer to these questions will be, will depend, to a considerable extent, upon the theorist's cosmological ideas. It is therefore essential, if we would appreciate the development of our knowledge of earth history, to pass in review the various conceptions of the beginning of things which from time to time have been held. While these theories are apparently without number, it will be seen that they belong essentially to five classes. First, it may be that there has been no beginning, but that on the contrary, the world has always existed; second, the world may have come into existence in the form which is now so familiar to us; third, in its present form, the world may date back to the chaos to which a former creation had been reduced; fourth, to arrive at the beginning we must trace back an apparently infinite series of kaleidoscopic combinations; and fifth, the familiar earth is but the present and temporary phase in an evolutionary chain whose initial link was forged when the universe first stood forth, and whose last link will have been reached when the force which was then concentrated within it, will at length have all been dissipated.

It is then apparent that any system of the earth's history will be based upon one or another of these five underlying philosophical concepts which have been successively adopted and discarded as the body of verified fact available has become increasingly adequate. Among the influences which have thus helped to shape the development of human knowledge, and make it possible to mold the heterogeneous mass of geological fact into one connected whole, there stand preëminent two great discoveries, the organic origin of fossils and the historical uniformity of the geological processes. Let us trace the slow acceptance of these discoveries, and mark their influence upon the birth and progress of the science of geology.

II

The earlier conceptions of the earth and its history, based, as they necessarily were, upon hypothesis, and not upon a knowledge of the laws of nature, were guesses rather than scientific deductions. Yet, when we seek to follow the development of the science, we must consider these earlier stages,

as well as the well-reasoned results of modern scientific investigation.

The primitive idea is, no doubt, that the earth has always been the same, and indeed we still sometimes speak of "the everlasting hills." The span of human life, when compared with the cycles of nature, is so brief that the observations of the most aged patriarch and the traditions of the race alike fail to tell us of any change in the familiar features of the landscape. It is then but natural to suppose that the changeless earth is eternal and that

> "The past is an unfathomable depth,
> Beyond the span of thought."

But while many philosophers may have found it impossible to conceive of the creation of the world, there have always been, in the mythologies of primitive peoples, stories of the beginning of things. Combining, then, the two ideas of creation and the changeless earth, there arose the conception that the earth came into existence full-grown and so perfect that no subsequent change was necessary. But, if it were eternal, or even if it has been changeless since its inception, the problem of its existence is beyond human comprehension, and the phenomena of the earth—the data of geology—have but a passing interest, and those deep questions which perplex the human mind are eternally unanswerable.

III

One important discovery, however, repeatedly made and successively forgotten, proves, when its true significance is realized, that the earth has had a history the records of which can still be read. This discovery was that, within the solid rocks of the earth's crust, there lie imbedded the remains of the animals and plants which in an age long past lived upon its surface, and that these remains form the documents from which the story can be reconstructed. This fact was known to Xenophanes, of Colophon, more than twenty-five centuries ago, and in all succeeding ages there were men of vision to observe it and to draw from it the correct deductions. But these conclusions had little influence in their own generation and were soon forgotten. In an uncritical age, characterized by unregulated speculation, it is not surprising that no more attention should be paid to scientific deduction logically drawn from verified data than is given to the wildest theorizing based upon untrue statement of fact, or no fact at all. And so it happened that many centuries must pass before the world could realize the importance of this fact, or the conclusions to be drawn from it.

The theory that these strange objects found in the rocks were the actual remains of animals which had lived long ago met with great opposition from men of conservative or prejudiced minds. Many and ingenious were the alternative explanations. Avicenna, the Arabian philosopher in the eleventh century, following the theory of Aristotle that nature is constantly producing living organisms from inorganic matter, supposed that in this process there were many abortive attempts, and that what we now call fossils are the agglomerations of atoms on the way to becoming living things, but by some defect in the carrying out of the plan, they will never be able to attain their goal. This idea, under various forms, notwithstanding the arguments of more enlightened men, persisted down to the middle of the eighteenth century. Fossils, the philosophers told us, might be considered as earthy concretions, as the product of some mysterious seeds of life in the vapors which rise from the sea, as the result of the force of crystallization, as the consummation of the influence of the stars, but as organic remains—never.

Some philosophers, indeed, saw in these strange markings in the rocks, the literal handwriting of God himself. And since they believed that Hebrew was the primitive tongue of man and undoubtedly the tongue spoken in heaven, it necessarily followed that, if we could decipher these cryptic words, they would be found to be written in that ancient language. Most successful of all the investigators who followed this line of research was Professor Beringer, of the University of Würzburg, who led his wondering students to the various outcrops in the neighborhood, and found Hebrew characters of progressively clear and distinct form. These were set forth in his learned monograph called *Lithographiæ Wirceburgensis* [1726]. But there is a limit to the extent to which even such minds as these can go, and on one dark day he discovered a rock containing a series of Hebrew letters even clearer than ever before, which as he spelled them out, to his amazement, proved to be those of his own name. The difficultly disguised amusement of his class, and the astonishing nature of his discovery at length revealed to him the fact that he had been made the butt of a practical joke, and with a heavy heart he hurried home to write to his publishers to stop the issue of that ill-fated monograph which, he had hoped, was to have brought honor and recognition to its author. But it was too late. The work now remains as a memorial to the heights of absurdity which can be achieved by those who base their work upon preconceived ideas rather than upon verified data.

As the reality of the organic origin of fossils was gradually admitted on all sides, the men of the opposition took another line of defense. In the undoubted evidences of a submerged land surface they saw the results of the universal deluge as described in the book of Genesis, and they thought that by combining the description contained in that book with such scientific facts as might serve their turn, a complete and satisfying system might be constructed.

Among those who sought thus to discover a connected "Theory of the Earth," were Burnet and Woodward. Their works, often elegant in style and displaying great erudition of a kind, are now mere literary curiosities and the examples of the product of a peculiar mental myopia which can see clearly those facts that may be used in support of a theory, but is blind to all others.

The first of these, *The Sacred Theory of the Earth* (1681), by Dr. Thomas Burnet, is described in the brilliant, yet caustic words of Goldsmith as "well known for the warmth with which it is imagined, and the weakness with which it is reasoned; for the elegance of its style, and the meanness of its philosophy." Dr. Burnet pictures for us an earth before the deluge, composed of the various materials which we now know, but all arranged in the order of their respective densities: first, the heavy and fiery center; next, the rocks of less weight and less heat; then, encompassing and covering them, the world of waters; on the face of the water a layer of oil, and around all, the atmosphere. In these primitive times the air was full of dust and other impurities which gradually were cleared out by the falling rain and formed an emulsion with the layer of oil, thus producing a solid and perfectly flat and unbroken plain, upon which the newly created beings found their home. This was paradise, a world of even regularity, unbroken by the displeasing forms of crag or precipice or mountain peak, a world appealing to the precise formalism of the eighteenth-century mind.

But gradually this ideal world became polluted by the crimes of the antediluvians, crimes which called down upon them the wrath of the

Almighty. The punishment consisted in permitting nature to take her course. The sun beating down upon the moist earth produced great cracks and crevices, which were not allowed to close. As these chasms increased in size the great abyss of subterranean waters was set free. Gushing out, it overwhelmed the land. This tremendous cataclysm, the universal deluge, brought with it its own cure, for as the waters rushed out, vast quantities of air were sucked in, and the underlying rock became full of great and yawning caverns. Into these the waters again subsided and little by little the mountain tops and finally the dry land itself reappeared.

John Woodward, who followed him, had this advantage, that he was not entirely unacquainted with the facts of nature. These facts, however, could apparently be used or ignored as the exigencies of the argument required. The earth, says our author, is built up of a great number of layers of various densities, but all disposed in regular order, the heaviest at the bottom, the lightest at the top. This arrangement must have been the result of a slow precipitation of the materials of which the rocks are composed from a primitive state of suspension in water. The vast amount of water necessary for this process was, no doubt, that which we read covered the earth when the windows of heaven were opened, in the days of Noah, and was with equal certainty supplied by the tail of a comet, through which aqueous envelope the earth at that time made its way.

But a difficulty arose. The fossils in the rocks were at length being recognized as the remains of extinct animals, and their presence in strata so recently formed required an explanation. Whatever one may say about the absurdity of Woodward's explanation of this stubborn fact, there can at least be no question as to its ingenuity. These fossils, said he, were already in the rocks at the time of the flood. The solvent qualities of so great a mass of water were sufficient to disintegrate all previously existing strata, but not the fossils themselves. These objects, possessing a special impermeability to water, remained intact, and when the immense amount of material in the waters was again precipitated, the fossils regained their old position.

Thus the facts of geology, at one time suspected of being subversive to the statements of Holy Writ, were now being made to fit in with geological theories based upon the then current ideas of what those statements really meant. Those philosophers whose systems were antagonistic to revealed religion were in consequence driven to discover another explanation for the occurrence of shells on the highest mountains. These, the learned world was informed, were the palmers' shells fastened upon the headgear of pilgrims returning from the Holy Land. In the gales which so constantly blew across the Alpine peaks, we have the reason for the loss of so many shell-encrusted caps, and the existence of shells so far above the level of the ocean, was thus easily explained.

IV

But a better day was even then dawning. Amid all these absurdities certain great facts were emerging. Fossiliferous rocks were becoming recognized as the documents from which the earth's history must be written. And it was admitted that they indicated a life upon the earth in a previous age, very different from that which we now see about us. The astonishment with which these remains were viewed by their first discoverers is indicated by the name which they gave to one of them—Paradoxides.

A study of these long extinct but once living things, gave rise to the conviction that there have been two worlds, that which we now know, and the antique world, which they called

"pre-Adamic," and which was populated by races of animals, some of them of colossal size and strange and bizarre appearance. Between these two worlds there had been a great gulf fixed, a gulf of annihilation. The ancient world had been destroyed and on its ruins there had been created the new and better one we know.

But as knowledge of fossils increased, it was realized that not only once but many times had the population of the earth completely changed. So the theory was expanded and the history of the earth was conceived as the record of successive creations, each differing from that which went before and from that which followed, and each in turn destroyed as a sum is wiped off the slate by a wet sponge. It was at these times of crisis, according to this hypothesis, that the great ranges of mountains had come into existence. This strange philosophy of the world, to which the name "catastrophism" was applied, was widely accepted at the beginning of the nineteenth century.

The theory of catastrophism, however, was soon seen to rest upon very insecure foundations. The great breaks which men thought they saw occurring between the life of succeeding formations grew narrower and finally disappeared altogether as the rocks of other lands were studied. In the strata of each period there were found the remains of species which had characterized the rocks of the immediately preceding age, and even among the beasts which roamed the earth before man appeared and which have now become extinct, there were those, as for instance the mammoth, which remained long enough to be hunted by our primitive ancestors and to have their forms delineated upon the walls of the hunters' caves.

V

Thus, world history at length stood revealed as a great and satisfying unity. Since the beginning, seed time and harvest had not failed. The operations of nature had never been completely interrupted, but had ever been subject to some great law in the working out of the underlying plan of the ages.

What this law was, and what the plan upon which the world had been wrought, was the object of research of James Hutton, physician, farmer, man of means, of Edinburgh in the later years of the eighteenth century, one of the great original geniuses who have laid the foundations of modern science. In his method he differed from those who went before him, for instead of obtaining his information from the writings of the ancients, he went direct to nature.

When this appeal was made, how different were the results obtained. In the flowing of the river, in the dashing of the waves upon the shore, in the wash of the raindrops, in the silent action of the frost, he saw the forces which are wearing down the uplands and carving them into the thousand irregular forms of mountain scenery. He also saw that the basalts laid away amid the layers of other rocks beneath our feet, were not, as was then generally believed, solidified sediments, but the lavas of an earlier day. Finally, he believed that the mighty forces revealed in mountain formation had been exerted slowly and imperceptibly, in exactly the same manner as the gradual changes in level, which apparently are taking place now in various parts of the world.

The earth is thus constantly changing. Its present condition is the result of those forces which we now see everywhere in action, and is but the momentary and evanescent link of an endless chain. As he looked back across the ages, he could see no force adequate to set these changes in motion, and as he looked forward he saw no reason to suppose that they would ever cease to be.

This new theory of the earth, given

to science in the year 1795, formed the foundation upon which has been erected the modern structure of geological knowledge. On account of its insistence upon the similarity of the geological processes in the past with those which we now see in action about us, it has become universally known as the "Uniformitarian Theory." It is this which has made it possible to create out of the heterogeneous mass of disconnected fact, a noble science which is leading the human mind into realms of philosophy heretofore undreamed of, and revealing secrets which seemed eternally hidden.

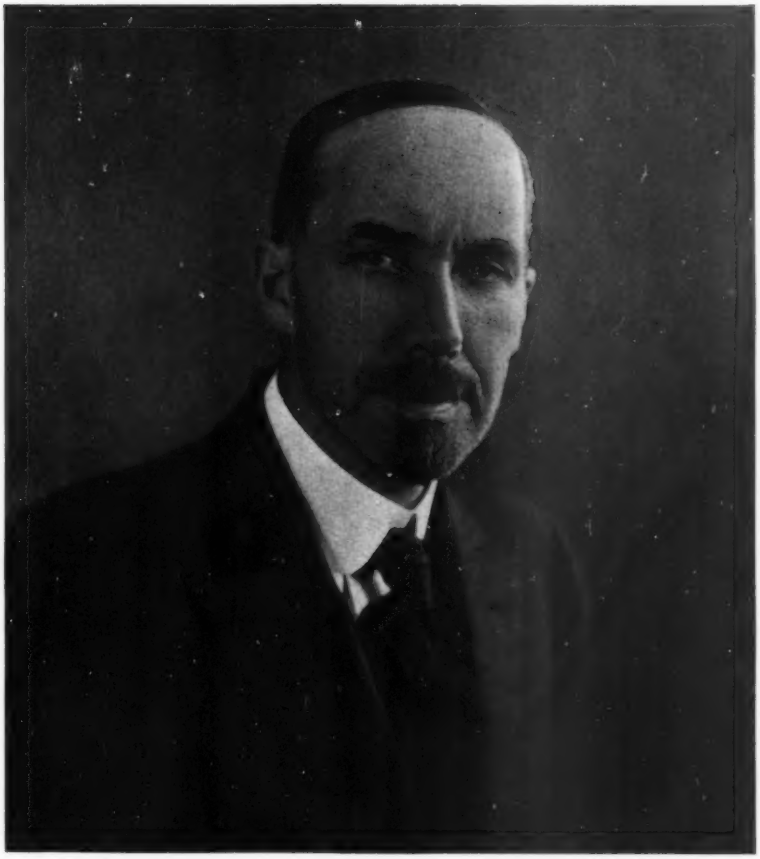
It was but natural that the propounder of this theory, which may now justly be elevated to the rank of a law of nature, as well as those who subsequently elaborated the system and by their illustrations achieved its general adoption, should have pressed its application a little too far. Moreover, the increased interest in the science which resulted from the discovery of this unifying law, brought to light many pertinent facts, which rendered necessary a restatement of some of its clauses. Consequently, certain modifications or reservations have been accepted to bring the theory into harmony with more recent geological knowledge. In the first place it has been found that the great upheavals of the earth's surface have taken place intermittently; that mountain formation has occurred always as the climax of long continued and imperceptibly slow elevation of the land, and that those times when mountains were born, which also were marked by intense volcanic activity, recurred periodically with a certain mysterious rhythmical regularity. In the second place it is becoming clearer that geological history is not a regular recurrence of like events, but a progressive change. The world of long ago, whose story we read in the rocks, was a very different world from that in which we now live, and in the world which is to be, the mountains, the lakes, the rivers, the familiar landmarks of today, will have again passed into oblivion.

These modifications of the uniformitarian theory, while they do not alter it in any essential particular, still give it a philosophical color which its author, no doubt, scarcely anticipated, and lead to the last or evolutionary conception of earth history. Thus modified, the theory pointed the way to a new revelation of the rocky strata. We now see in them the record of a progressive development, which characterized not only the earth's geographical features, but also to an equal extent the forms of plant and animal life which found their home upon its surface. Far back in the distant past there was a beginning, and some day in the distant future, the energy which was concentrated in our solar system will finally have become radiated into space and have disappeared.

VI

To have constructed a history of the earth from records at once so undecipherable and so fragmentary as those we find in the rocks, is one of the greatest triumphs of human genius. To this achievement, as we have seen, two great discoveries have contributed, the knowledge of the nature of fossils and the uniformitarian law. But this history is not yet complete. Each year the body of data from which it is being reconstructed becomes fuller. New discoveries of the most vital importance are constantly being announced. Gradually the story in its completeness is being revealed to us, so that we may, in the words of King Henry IV,

> "read the book of fate,
> And see the revolution of the times
> Make mountains level, and the continent,
> Weary of solid firmness, melt itself
> Into the sea! and, other times, to see
> The beachy girdle of the ocean
> Too wide for Neptune's hips; . . ."



John Campbell Merriam: New President of the Carnegie Institution

By W. D. MATTHEW

Curator of Vertebrate Palæontology, American Museum

JOHN C. MERRIAM is professor of palæontology in the University of California, chairman of the Division of States Relations of the National Research Council, a leading authority on fossil vertebrates, and a remarkably successful organizer of scientific research. It is in this last and highest capacity that he is now serving and will render his most important contributions to the progress of science.

He was born in 1869 at Hopkinton, Iowa, graduated at the University of California, and took his doctorate at Munich in 1893 under Zittel. He returned to the University of California the next year as instructor in palæontology, was appointed assistant professor in 1899, associate professor in 1905, and full professor in 1912.

The palæontology of California and the Pacific Slope afforded a vast and little-known field for exploration and research. Merriam attacked this problem with remarkable success, due to systematic and persistent work and close coöperation with geological research. He trained a staff of able and

energetic assistants, inspiring them with his own enthusiasm and broad ideals, and organized and directed their work with marked executive ability.

The result of these explorations during the last twenty years has been to bring to light a series of fossil faunas on the Pacific Slope that begin to rival in interest and scientific importance the discoveries that have been made to the east of the Continental Divide. The wonderful deposit of Rancho-la-Brea, near Los Angeles, the richest fossil quarry in the world, owes its recognition to Dr. Merriam, and the admirable way in which it has been worked and studied is due largely to his wise guidance and advice. A series of Tertiary mammal faunas, extracted by persistent search from formations that at first sight appeared discouragingly barren of fossils, has enabled him to reconstruct this part of the geological succession and correlate it with the marine formations and invertebrate faunas far more satisfactorily than had been possible before; so that the California section bids fair to be the standard of reference for other regions. These are but two instances selected from a wide range of discoveries and researches during the last two decades.

Personally likeable, public-spirited, sincere and fair-minded, generous almost to a fault in his relations with his *confrères,* Dr. Merriam has been called upon more and more in recent years for organizing and administrative work. He was a leader in the organization and subsequent activities of the American Palæontological Society, and has taken an active part in the affairs of various other scientific organizations. As chairman of the Pacific Coast Committee of the American Association for the Advancement of Science at the time of the Panama-Pacific Exposition, he did much toward bringing to the attention of visitors the scenic beauties and features of scientific interest of the Pacific Slope. Since the United States entered the great war, he has been drafted for executive work, chiefly in the organization and direction of various research activities, and has been able to spare but little time for personal research in his favorite science. He now becomes president of the Carnegie Institution.

The administration of this great endowment of more than twenty million dollars under the retiring president, Dr. R. S. Woodward, has set a high standard for organized work in pure science. Great as are the resources of the institution, they might easily have been frittered away without any commensurate gain to science or humanity, through casual or unsystematic expenditure or the encouragement of the innumerable more or less visionary projects continually urged upon the trustees. The policy of the institution has been to limit its activities to a number of important problems requiring cooperative research upon a comparatively large scale, and to the support of systematic researches by individual investigators in selected subjects where cooperative research was not required. Among the larger projects the Solar Observatory at Mount Wilson, the Desert Botanical Laboratory at Tucson, the observations of the "Carnegie" on terrestrial magnetism, the Geophysical, Marine, and Nutrition laboratories are the most important. The results achieved and solid advances made in science through the work of these laboratories and individual research associates vindicate the wisdom of the past policy of the institution which will doubtless be continued in substance under its new president.

That Dr. Merriam's health and strength may be preserved for many years of scientific activity and achievement in his new position will be the prayer of his numerous friends and admirers.

LAFAYETTE NATIONAL PARK AT BAR HARBOR, MAINE

BY GEORGE B. DORR

Superintendent of Lafayette National Park

FRENCHMAN'S BAY FROM THE SUMMIT OF CHAMPLAIN MOUNTAIN

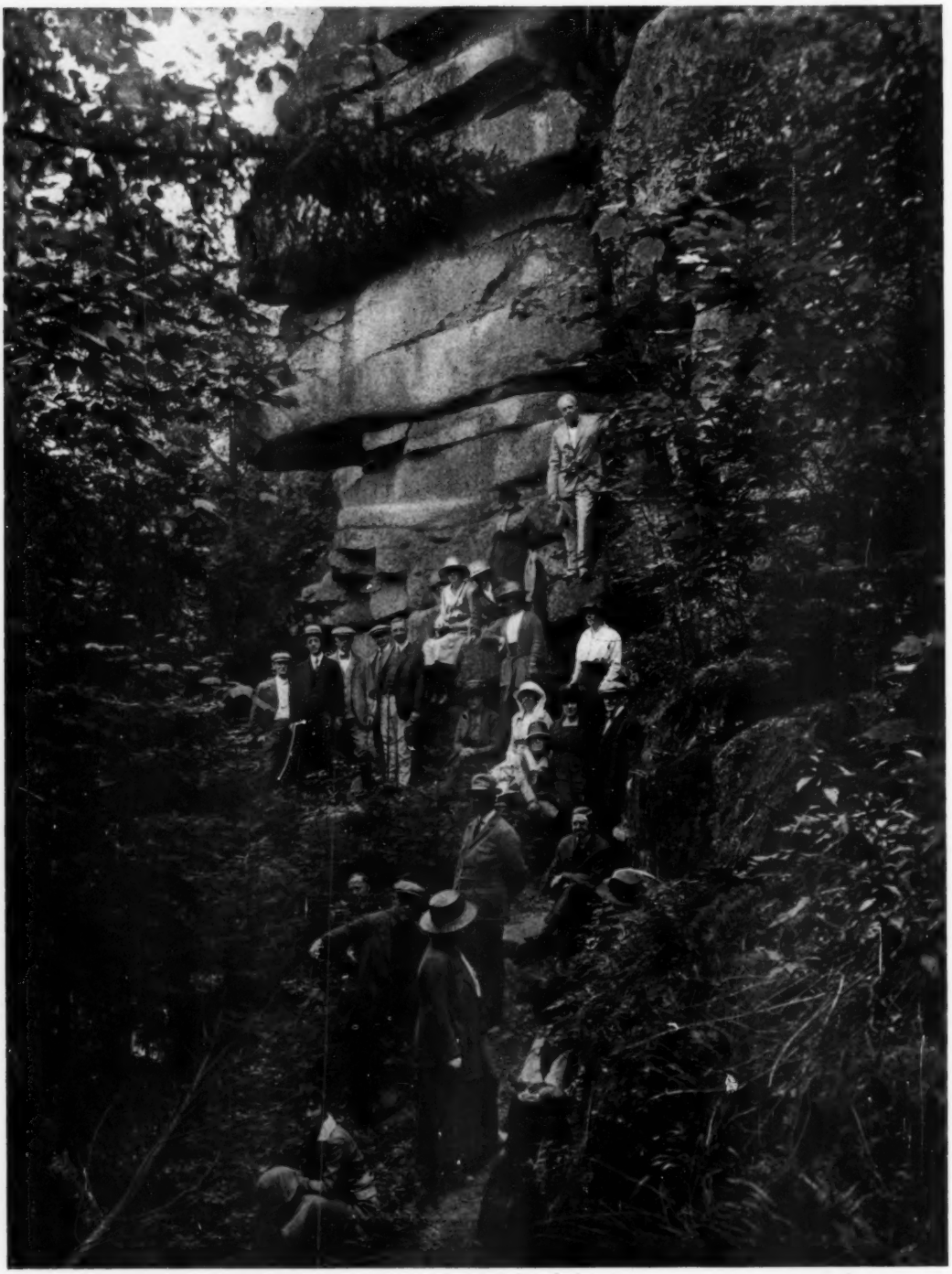
In February, 1919, the President of the United States on his return from Paris signed a bill creating the first national park, other than war memorial, to the eastward of the Mississippi—Lafayette National Park, situated on Mount Desert Island, Maine, at the crowning point of beauty on the New England coast.

Mount Desert Island was discovered in September, 1604, by Samuel de Champlain, while on a voyage of exploration for Sieur de Monts, the founder of Acadia. Champlain called it *L'Ile des Monts Deserts*, "the Island of the Wild and Lonely Mountains," from the bold peaks which rise up from its shore.

The present title to all the land not held by early "squatter's right" lying to the eastward of Somes Sound dates back to a grant from the Commonwealth of Massachusetts to the granddaughter of Antoine de la Mothe Cadillac, to whom the whole island had been originally granted in 1688 by Louis XIV; the land lying to the westward of Somes Sound was deeded similarly by the Commonwealth of Massachusetts to John Bernard, son of Sir Francis Bernard, the last provincial governor of Massachusetts save Hutchinson, to whom that province had deeded the whole island in 1762, ignoring Cadillac's earlier claim.

In recent times this island has become famous as a summer resort. In 1916 an association[1] formed for the conservation of its landscape in the public interest offered the National Government a tract of five thousand acres which President Wilson accepted and proclaimed as the Sieur de Monts National Monument. Three years later, in 1919, the status of this National Monument was changed by Act of Congress to that of a National Park—under the name of Lafayette National Park, the first in the east. In addition to the interest of its historical associations and its importance as a great resort, valuable work is contemplated in it by the National Park Service along the lines of wild life conservation. Forest typical of the Acadian region still occupies extensive portions of the park land, now doubled in area since its first acceptance by the President. Deer are already abundant in its protected woods, and beaver, which once crowded its waters, are now actively reëstablishing themselves upon them. Its position on the Atlantic Coast bird migration route gives it unique importance also, in relation to bird conservation; and the native flora needs protection only to become rich in beautiful and interesting species

[1] This association was jointly organized and promoted by Mr. Dorr, now superintendent of the park, and by Dr. Eliot, president emeritus of Harvard. (See portraits on page 264.)

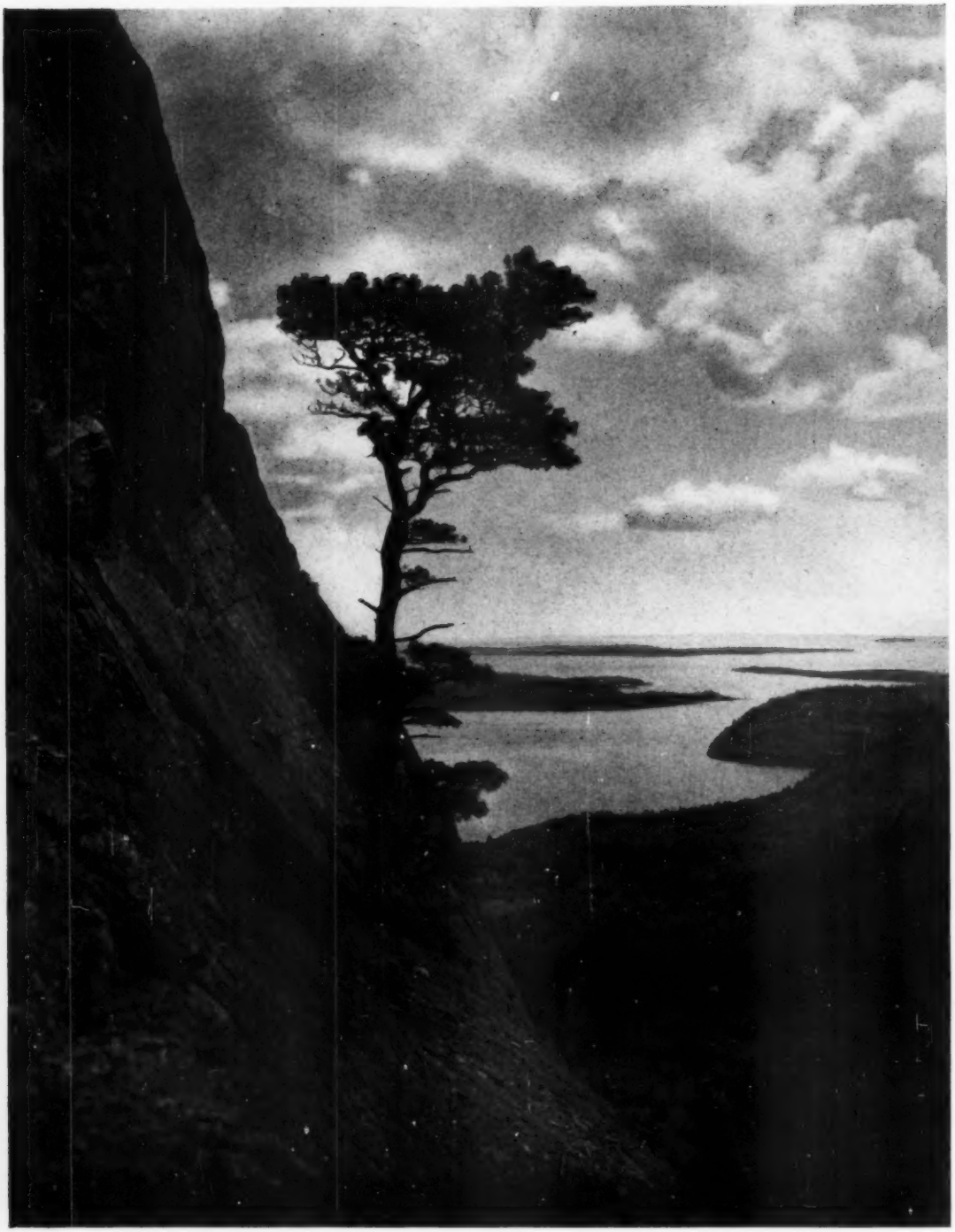


THE APPALACHIAN MOUNTAIN CLUB AT THE CADILLAC CLIFFS

The Cadillac Cliffs, bordering Lafayette National Park on the ocean front, are ancient sea cliffs, cut by the stormy beating of an Arctic ocean in the Glacial period when the land stood at a lower level and Mount Desert Island was a lonely group of mountainous islets far at sea

A STAIRWAY BUILT TO ENDURE

These steps lead up the wooded side of Flying Squadron Mountain from Sieur de Monts Spring in Lafayette National Park. The frost-split granite lends itself remarkably to such construction and nature quickly takes possession of the trail, filling every crack and crevice with plants that love the acid mountain soil—blueberries and mountain cranberries, trailing arbutus, and a host besides

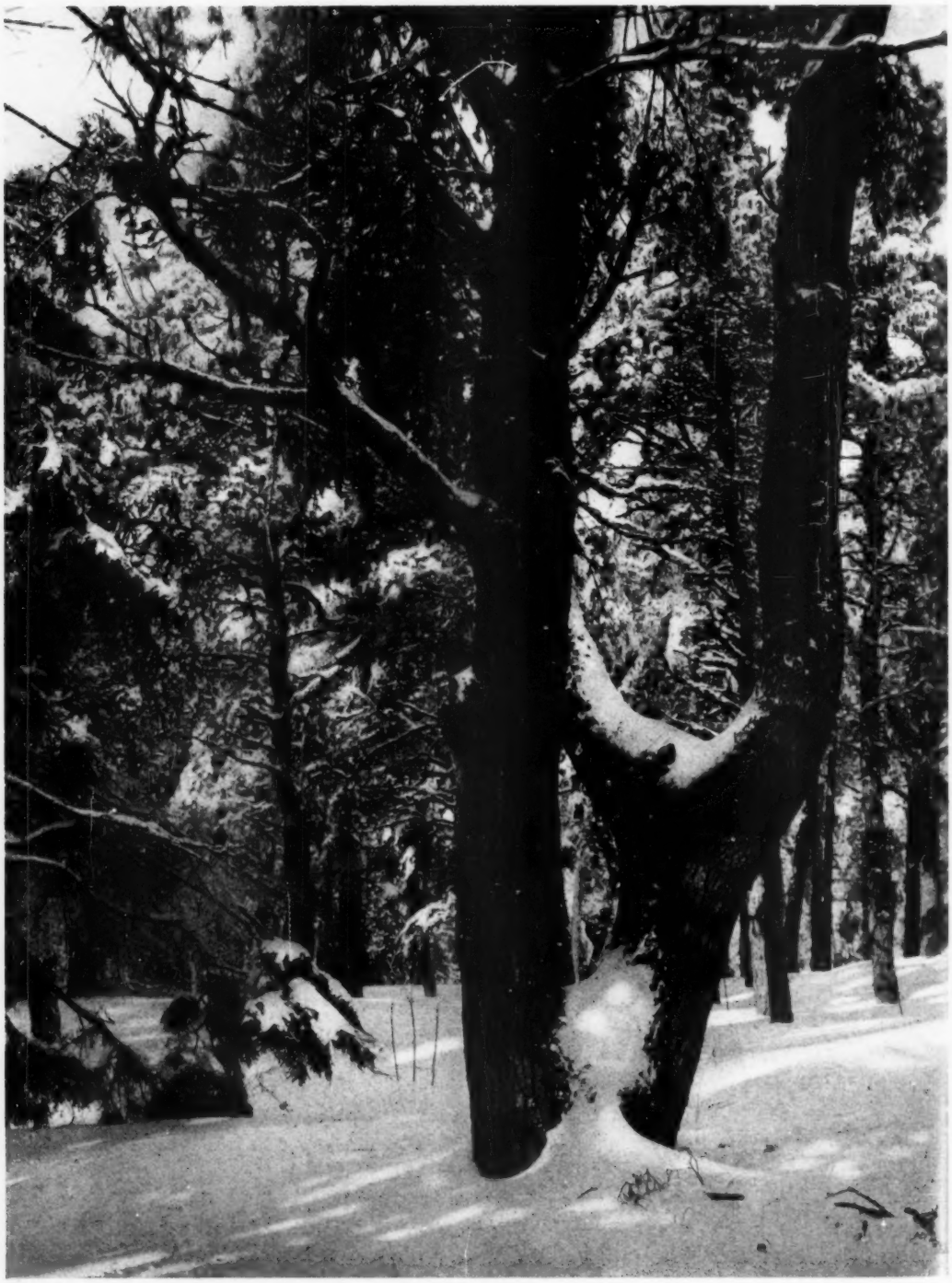


PITCH PINE UPON ACADIA MOUNTAIN AND THE ENTRANCE TO SOMES SOUND

Somes Sound is the single glacial fiord upon our eastern coast. It was here that the first French missionary settlement in America was made in 1613, and the wrecking of this settlement by an armed vessel from Virginia was the first act in the long struggle between France and England for the control of North America

YOUNG BALD-HEADED EAGLES IN LAFAYETTE NATIONAL PARK

This bird, *Haliæetus leucocephalus*, the white-headed sea eagle, is our national emblem and has been taken as the emblem also of the Lafayette National Park, whose ocean-bordering cliffs and woodlands are its natural haunt. The nest, photographed in 1919 and again occupied in this year of 1920, is built high in a dead maple top

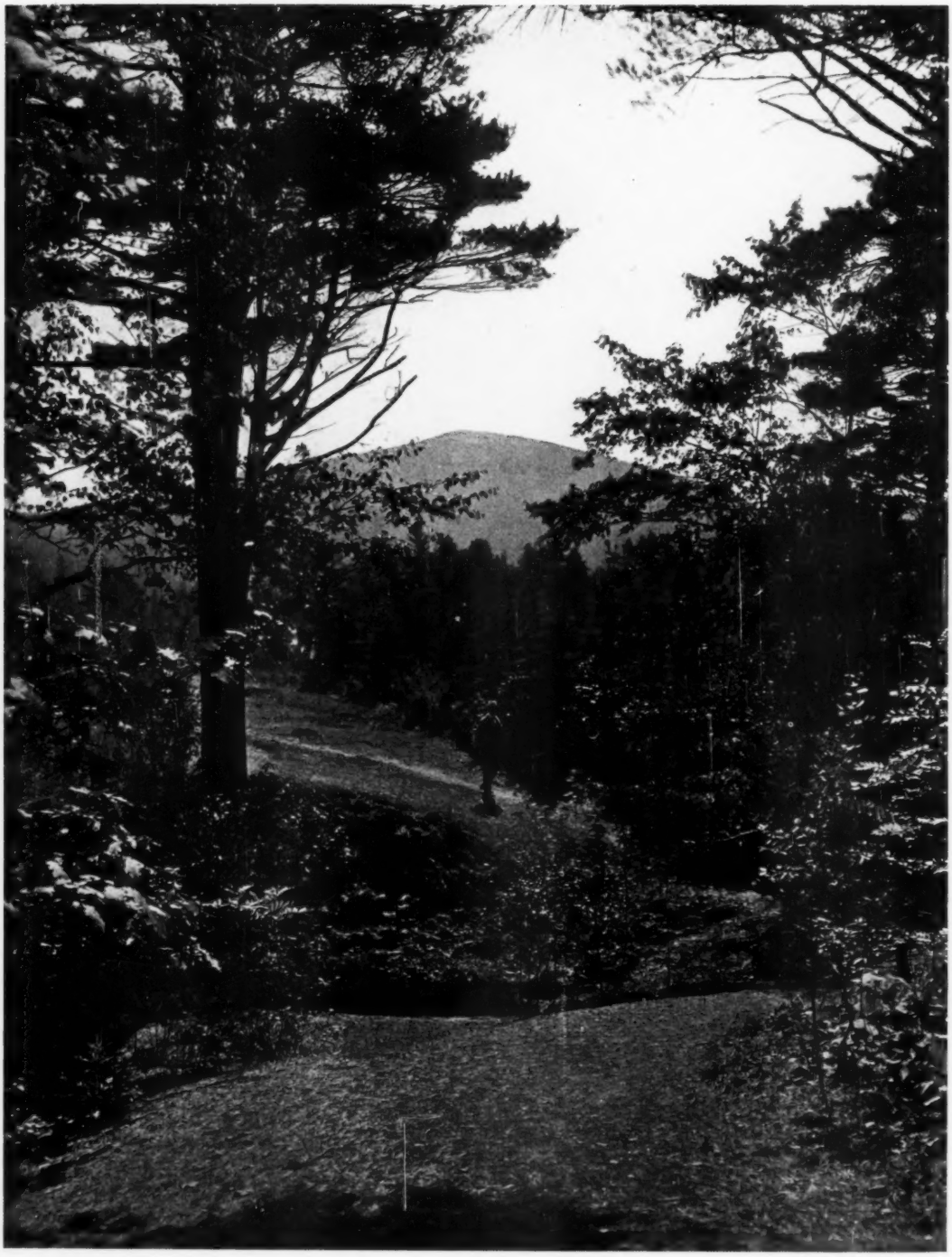


WINTER AMONG THE PINES

The beauty of the New England winter is greatest in the belt of latitude in which Mount Desert Island lies, passing through the White Mountains, the Green Mountains, and the Adirondacks. It is a belt characterized throughout by its abundant evergreens, whose winter foliage nothing in the landscape can replace

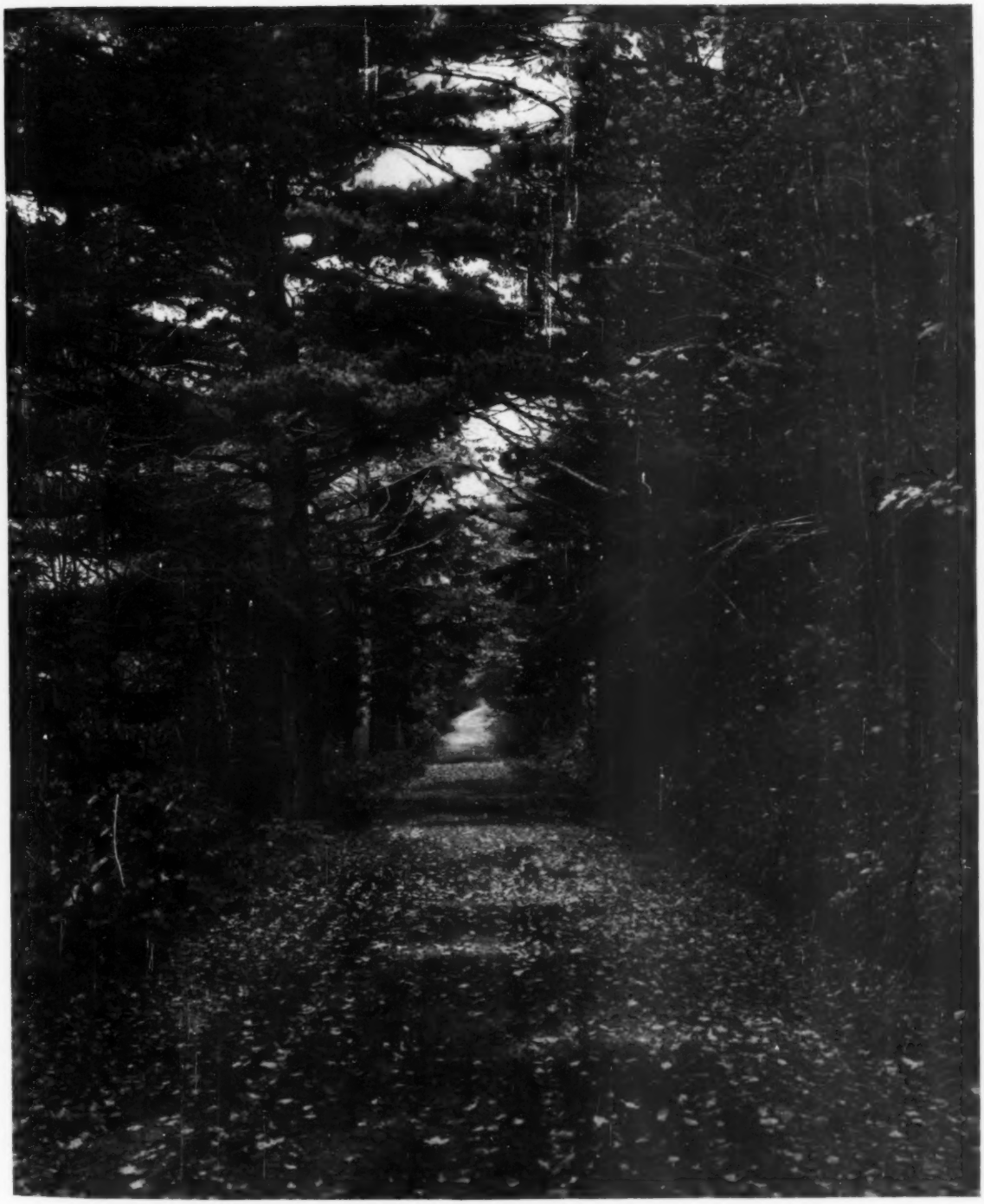
ONE OF THE MOST BEAUTIFUL NATIVE WILD FLOWERS

To be ome abundant in Lafayette National Park the fringed orchid *Habenaria fimbriata* needs protection only. The whole region is rich naturally in flowering plants, and the extraordinary concentration of favorable conditions in the park fits it uniquely to become a sanctuary for them, and a means toward their preservation



EVELYN'S MILE

This approach from Bar Harbor to the Lafayette National Park has been built in memory of a child whose name it bears. The walk runs for a part of the way through cultivated ground, dedicated for the purpose. It is planned to make this a garden entrance, naturalizing along its sides the hardy plants for which Bar Harbor gardens have been famous



IN AUTUMN

Road to Sieur de Monts Spring, its surface strewn with fallen leaves.—Lafayette National Park is unique among national parks in its wealth of hardwood trees, characteristic of the Appalachian forest, and the brilliant beauty of its autumnal foliage. In it one sees at its best and fullest the forest of the north

PLANTING A PEACE TREE IN THE PARK

A young Sequoia from California was presented by Dr. Robert Abbe, of New York, to the Lafayette National Park. President emeritus Eliot, of Harvard, Mr. George B. Dorr, of Boston, who is supcrintendent of the park, and a group of children are shown engaged upon the planting.

We may well contrast the mental outlook of these children in their free out-of-door life with that of the East Side New York City children pictured in Mrs. Northrop's article which follows

Nature and the City Child

By MRS. JOHN I. NORTHROP

President of the School Nature League of New York City

NATURE in the congested parts of New York City might be compared to the snakes in Ireland, "there isn't any," yet it would surely seem that every child should learn something of this world into which he has been born and where he may live his three score years and ten, should know something of woods and fields, of the birds and animals that dwell in them, and the flowers that bloom in them. How little of all this the city child really does know, few people realize.

About fifteen years ago the Board of Education put nature study into the school curriculum and drew up a comprehensive outline for the course of study, but unfortunately it made no provision for the "nature" to be studied. It *does* provide nature material for the biology courses in the high schools, but the psychological time to interest children in nature is while they are in the elementary schools, when everything in the outside world is still full of fascination for them. Nature cannot be learned from books, and as the greater number of the teachers are city born and bred and have not learned in any other way, very few are qualified to take up any kind of nature work with their children without the actual specimens before them. At one of our exhibitions, a teacher, looking at a labeled specimen, was heard to remark, "Oh, I gave a lesson on that last week. I didn't know it looked like that!"

So the children learn the words but not what they stand for. They can repeat poems about roses and buttercups and ferns, but they do not recognize them when they see them; they will call everything "roses or violets," and ferns often suggest only "soup greens." An ordinary brown bear caterpillar was once shown to a number of classes. The children ventured opinions that it might be a frog, a turtle, a snake, or a worm, but when told it was a caterpillar, with one accord they glibly informed us that "it turns into a chrysalis and then into a butterfly."

The American Museum of Natural History, through its department of public education, has accomplished much good by means of talks and pictures and the traveling cases of specimens it lends to the schools. It is a long step in the right direction, but it is not enough to bridge the gap between city and country. In many sections of the city the child, and also sometimes the teacher, can supply no background whatever; the bird or insect or shell is only a thing in a box, he cannot imagine it in the woods, among the budding trees, flying over flowery fields, or on a sandy beach, because he has never seen these things.

Realizing the futility of much of the so-called nature work, the educational authorities are, it is said, considering dropping the subject in the most congested districts and retaining it only in the suburban schools where material for study is readily available. Some of us who have been interested for many years in the teaching of nature in the schools feel very strongly that the thousands of children who are condemned to a brick and mortar environment are the very ones who need "nature" most, and who would most appreciate a glimpse into another and more beautiful world.

The School Nature League, which was organized in 1917 "to increase a knowledge and appreciation of nature in the children of our public schools," decided to see if something could not be

MRS. JOHN I. NORTHROP

President of the School Nature League, New York City

If we cannot take the children of New York City to the country, we must bring all the country that is transportable to the children. It seems only fair that the many thousands of children confined to an environment of brick and mortar should know something of the living world into which they have been born and where they are to spend their three score years and ten. And how could it be anything but misfortune that they should have no share in the joy that comes from knowledge of the woods and fields spread out in sunshine with their trees and birds and flowers?

Moreover, one of the great needs of America is a larger number of men and women who like the country well enough to be drawn to enter agricultural life. Here in the heart of New York, a world of high stone walls and narrow stone pavements, incredibly congested with human beings, the School Nature League is creating among the children, through the stress of their very lack, a profound longing for the wide out of doors. Why should not the nature rooms in the schools prove laboratories which will instill, at just the years when children are most easily influenced, an interest so deep that some at least will ultimately be led into such work as scientific farming? The experiment is surely worth making

Courtesy of Underwood and Underwood

OH, HOW I WISH I COULD SEE THESE THINGS GROWING!

Members of a class of crippled children in their nature corner at Public School No. 75

These rather serious-minded little people delight in wandering slowly about their woods corner, back and forth wherever they wish, examining objects that interest them—the budded twigs from trees in "the country," the shell that whispers into their ears the roar of the sea. It is in large part the voluntary and individual character of the observation that makes the strong appeal and impresses their minds indelibly

Courtesy of Underwood and Underwood

A seabeach—at first so unfamiliar.—Sand is always fascinating, even if there is only a little—just enough to pour back and forth through the hand (see child at the right in the picture opposite). An isolated shell, or a starfish, or fragment of coral is an object of curiosity. But relate all these, spread them out on a table, and the interest is enhanced a hundred-fold. The imagination sees a miniature seabeach. The shell is no longer dead and empty but animated by the animal that always moved within its shelter. Especially is the sense of life imparted in the minds of the children to everything on the miniature beach by the presence of the aquarium. Delicate green plants sway here and there as the goldfishes, polliwogs, or newts swim past. And the correlation is particularly strong in the instances where the nature room is light enough to allow the establishment of a salt-water aquarium with green sea lettuce, with sea anemones, sea snails, and tiny fish. During 1919 nearly six hundred teachers, representing twenty-six different schools, were supplied with material for leisurely "follow up" observation in the classroom, correlated with the relatively occasional nature room visits

done to bring nature and the city child together. It could not take the children to the country, so went at the problem from the other end and tried to bring all the country that was transportable to the children.

Through the kindness of the Board of Education we were allowed the use of vacant rooms in some of the schools for our experiment. Some of the rooms were dark and dingy and some very tiny, but we did our best to transform them into real "nature rooms," making them as "woodsy" as possible with leafy branches, winter bouquets of fruits and seeds, and when there was sufficient space, with one or more cedar trees in which mounted birds and squirrels (loaned by the Museum) disported themselves near their nests. Every room has a green expanse of moss and lichen dotted with ferns and here and there a bit of partridge berry or wintergreen, which we tell the children is what the floor of the woods looks like. Rather surprisingly, this is one of the favorite exhibits, and children never tire of feeling the moss, "so nice and soft."

In another corner is a miniature

Courtesy of Underwood and Underwood

THE SEASHORE MUST BE A VERY WONDERFUL PLACE

beach—stretches of sand strewn with pebbles and shells, corals and starfishes. In the rooms that are sufficiently light the beach has in its midst a "sea garden"—a salt water aquarium with sea anemones, sea snails, sea lettuce, and tiny fish. In the other rooms are fresh water aquaria with the always fascinating goldfish, "polliwogs," newts, and turtles, and in one or two of the rooms are terraria with garter snakes and a few frogs or small lizards as inhabitants. Even when the animals move, the children always ask, "Are they real?"

Among these permanent exhibits are tables for seasonable nature material, that these city children may be kept in touch with the changing year, even though their daily surroundings are grimy brick and mortar. For example, spring comes to the nature rooms in the shape of budding twigs, germinating seeds, sprouting acorns, and early flowers, and on the animal side, in fascinating frog and toad spawn that may hatch before one's very eyes, or cocoons and chrysalises that may disclose their wonderful secrets at any time. Common wild and garden flowers, from the skunk cabbage and crocus to the daisies and roses, keep the flower tables in the nature rooms bright from April until late in June, when the rooms close.

They are opened again in October, gay with autumn foliage and the wild and garden flowers of fall, together with fruits and seeds of many kinds, the latter arranged to show their method of dispersal. December brings holly, evergreens, and cones to the rooms, while we utilize the tables in January for exhibits of bird and insect homes and their builders, arranging the nests in leafy branches or in their appropriate habitat, with the mounted bird near by (the latter loaned by the Museum); also nests of mud and paper wasps, and perhaps a trapdoor spider's fascinating nest in a box of sand; or we may show types of birds and animals, or collections of woods, or of common minerals. Some of these collections are moved about from room to room. In February we bring in the budding twigs, which to the children's endless delight often leaf out and blossom, and we also start seeds germinating, while March ushers in the spring again.

To step out of the dirty, squalid street into these woodsy retreats is a constant surprise to the children. One little visitor asked wonderingly, "Is this a school?" and another said, "This isn't a school, this is a woods," and the little kindergarten children always call a visit to the nature room "going to the country." Even to the adults it is a veritable oasis in a wilderness of bricks. One mother said it was the first bit of outdoors she had seen since she had left the country of her own childhood many years before.

The School Nature League now has seven nature rooms in as many different schools, the exhibits naturally varying somewhat according to the size and the amount of light. Several principals who were anxious to have nature rooms could not spare an entire room, so in the Crippled Children's School we utilize one end of a large work room; in the School for the Deaf the large platform in the assembly hall was the only available space, while in a third we have converted the equivalent of a tiny hall bedroom into a "woods room" and its twin into a "bird room." It is really surprising how much pleasure and profit and how much real feeling for nature the children get even in these cramped quarters. If good work can be done under these conditions, there are surely very few schools that cannot make some provision for nature study.

All of the nature rooms are visited during school hours by classes with their teachers, usually for half-hour periods, and regular lessons on some special material are often given. Specimens are always clearly labeled. Some of the larger rooms are "neighborhood

nature rooms," and a certain amount of time each term is allotted to schools within walking distance. Last year the five nature rooms then in operation were visited by more than 25,000 children representing nineteen different schools. As many classes came a number of times, the 25,000 represent visits rather than different children. Superintendents, principals, and teachers all bear testimony to the value of the nature rooms in imparting the breath of life to what was formerly the dry bones of nature work. The teachers are grateful for the help, and tell us their classes often talk of the visits to the nature room for weeks afterward.

One of the most interesting experiments in the work has been throwing open the room at 25 Norfolk Street to the children who wanted to come in after school. At first we kept it open only one day in the week, but soon found we could not accommodate all our would-be visitors. When one girl wrote us, "I wish that the nature room would give us more visits a week than she does," we felt impelled to open it twice a week, and many of the children tell us they would like to come every day.

If anyone doubts whether the children of the East Side love birds and flowers let him come to Public School No. 62 any Tuesday or Thursday afternoon from three to four-thirty o'clock. The moment the door is open the youngsters crowd in, from toddlers of three and four, escorted by an older sister or brother, to boys and girls of the junior high schools, who ask to see all sorts of things they have read about. A number come regularly and act as guides to their friends, proudly pointing out the terrarium where the snake lives, the shark's jaw with its generous supply of teeth, hanging by the window, the stuffed squirrel and his nest in the cedar tree, or showing how the puffballs on the moss table "puff." The room is evidently a fairyland to them, and we have hard work to get them out at closing time. They walk about from table to table, some of them taking notes, and their delight is unbounded when they find something they have before known only in books. The regular visitors look about for new arrivals on the tables and several of them say that they come every week, and that they know everything that is in the room.

A group will stand spellbound with shining eyes and parted lips while we talk to them about the different kinds of nests, point out the front door of the woodpecker's hole and the chisel-like bill with which he made it, or let them inspect the wonderful weaving of the oriole's cradle, or tell them how the chimney swift makes its curious nest, or the marvel of the humming bird's tiny home. They are just as much interested in the shells and starfish and corals on the beach or the spore plants on the moss table, in the "dust" in the puffballs and earthstars, and where the spores are to be found in the ferns and mosses and club mosses. After a talk of this kind one child wrote, "I thank you for staying in that afternoon and teaching us a wonderful lesson about flowerless plants. Puffballs I think are the most curious plants I saw. I love to see them have their spores out of a little hole." Another wrote, "I go to the nature room every week, I like it better than the movies," while a third said, "I went down to the nature room and I saw everything. I saw all kinds of flowers and I saw all kinds of plants. I saw all kinds of fishes and starfish and I saw frogs' eggs."

That the interest of the children is more than a transient curiosity is proved by the report of the librarians of the neighboring Seward Park Library, who said they could not understand the unprecedented demand for nature books until they saw the nature room. The children are also so full of the wonders of the room that in many cases they importune their teachers

Courtesy of Underwood and Underwood

FUTURE CITIZENS OF AMERICA

Visiting an exhibition of birds and their nests in the nature room at Public School No. 62, New York City

The years of early youth are the impressionable years, when in the child's mind is laid a foundation on which the superstructure of manhood or womanhood will rest. There can be some approach in the future toward making the American nation what we wish through education of the children. Our schools need men and women of strongest character, not merely of keen mind, who through direct personal contact for many hours each day and frequent personal expression will imprint their high ideals upon the children of America

Courtesy of Paul and Company, New York

AT A FALL FLOWER SHOW OF THE SCHOOL NATURE LEAGUE

Public School No. 15, Manhattan

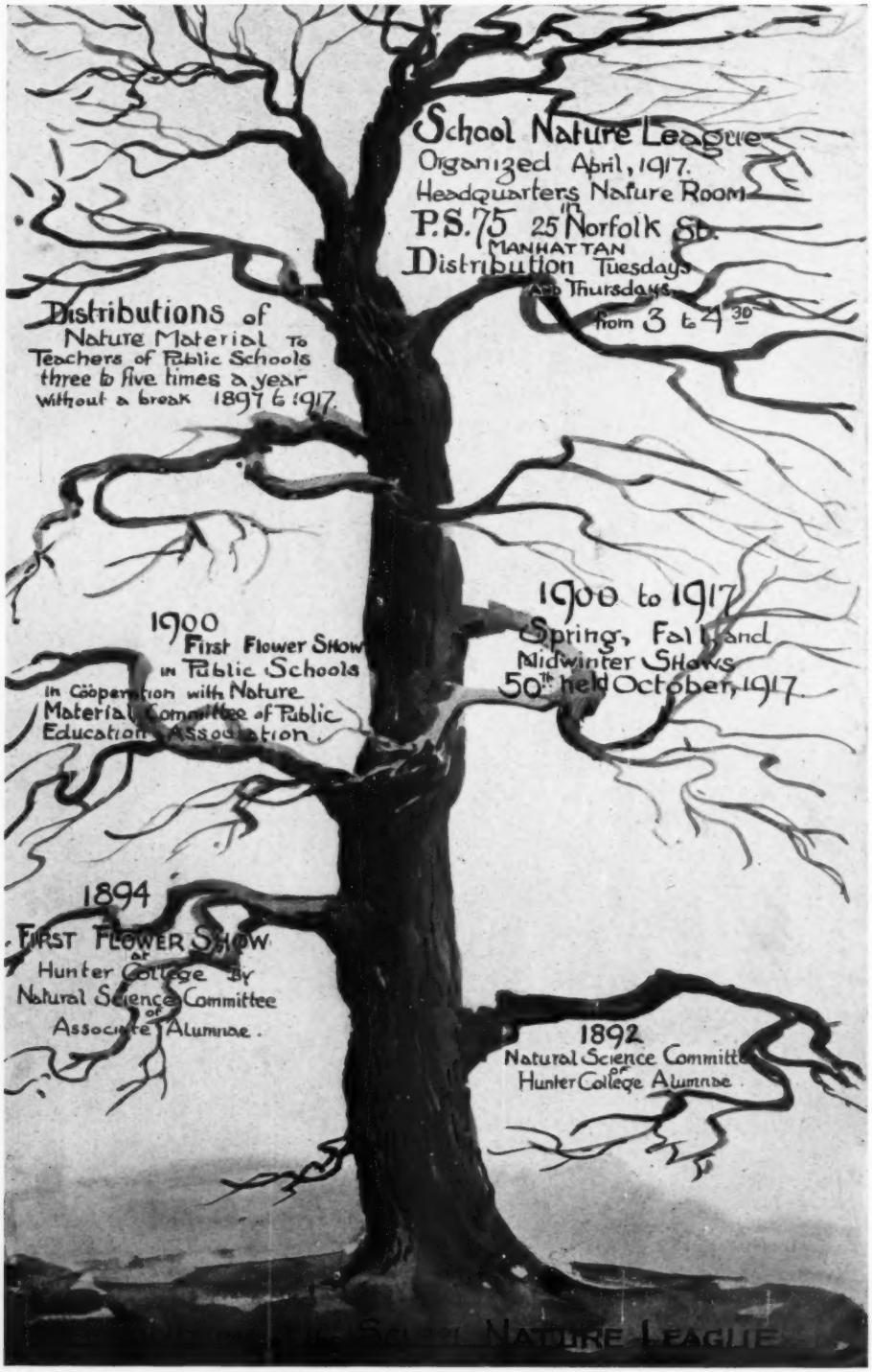
The "flower show" is now a regular part of the work of the School Nature League of New York City, under Mrs. John I. Northrop. Ever since 1900 there have been held three shows each year, in spring, fall, and midwinter, respectively. The fiftieth exhibition occurred in October, 1917. In 1919 about 10,000 children visited the flower shows.

The shows are held in different schools different years, and as often as possible in schools which have not yet an established nature room. There may be more than two hundred different kinds of plants exhibited. The wild flowers and the garden flowers are arranged separately, each distinctly labeled with its common name.

Something of the contrast between the usual life of the children and these four to ten days of the beauty and fragrance of flowers and tree branches may be understood from the following statistics: "In New York East Side schools of a thousand pupils it is sometimes true that more than 75 per cent have never seen the country, and more than 50 per cent have never seen even Central Park of New York City. There are schools on the East Side where not even one member has ever seen grass growing."

Source of material is the great and ever troublesome problem of the School Nature League. At present although it has the coöperation of various institutions and individuals, the greater part of the supply of flowers for any particular exhibition, or for the steady upkeep of the nature rooms, is obtained by the League members themselves or by their friends. Innumerable long-distance automobile trips are made to country spots in New York or adjoining states where flower growth is abundant or where some highway or other "development" has decreed that all the wild flowers and other plant growths of the area shall die.

It would be fortunate for the schools if there could be a definite and formal agreement of coöperation with the city parks by which they would grow for the schools as a part of their regular work certain flower "crops"—a contribution to the higher development of the city's children. For, on the curriculum in the lower grades, nature work stands almost alone as a subject with strong appeal to the spiritual side of the child



The work of the School Nature League has been developed under the direct leadership and supervision—without remuneration—of Mrs. John I. Northrop, whose portrait is presented on page 266. Mrs. Northrop started this work in 1892, with Hunter College graduates who had been in her classes as helpers. She has given herself to the needs of the children of the East Side for more than twenty years—with energy and good cheer, with large knowledge of nature, and sympathy of understanding for pupils and teachers.—THE EDITOR.

until they come to visit the room with them.

The League also has had nature poems printed, entire poems or extracts from Emerson, Tennyson, Lowell, van Dyke, and others, which are given to the children or their teachers at the appropriate season, or when the subjects written about are on exhibition. The children often learn these poems of their own accord. One little girl wrote, "I have been but once to the nature room, but you can't guess how I enjoyed it. I was very glad we had the poem on trees (Joyce Kilmer's) because in the nature room I saw cedar trees and branches of trees."

Realizing that the occasional visits to the nature room, which are all that is possible in most cases, are not enough, the League provides for "follow up work" in the class rooms by supplying the teachers with specimens which the children can watch and study at leisure. Even if the teacher can find little time for regular lessons, the developing twig, sprouting seed, or growing tadpole teaches its own fascinating story. The children who come to the nature rooms regularly are intensely interested in having a "nature room in our class room," and they tell us proudly of the new leaves on their horse-chestnut twig or flowers on their cherry branch, or that their tadpole is "getting hind legs," while others whose teachers have no interest in nature come in dejectedly and beg us to "get our teacher to come to the nature rooms and get twigs and mosses and nests and things." In these cases we give the children some specimens and advise them to look about carefully and then tell their teacher about all the different things they can find and how much they enjoy them, and to invite her to the room until she comes, and usually she does come and is promptly converted. If after a lesson in the rooms, we ask the children if they would like to have some of the things to take back to their classrooms, their eagerness and delight are really pathetic, and off they go bearing their treasured twigs or nests or flowers as proudly as if these were a king's ransom.

Two of the nature rooms are kept open on certain afternoons every week from three until half-past four to give teachers an opportunity to come for nature material. During 1919 we supplied 576 teachers representing 26 different schools with such things as fruits and seeds, autumn foliage, winter bouquets, birch bark (taken from "down timber" only), mosses, lichens, fungi, evergreens, cones, frog spawn, birds' and wasps' nests, shells. When teachers are sufficiently interested to become members of the League (by the payment of fifty cents a year) we also give them Audubon leaflets, as well as others we have ourselves published on buds, fruits, seeds, and on lower plants. We label their specimens, tell them how to care for the material, and help in every way we can. Those who come are always most grateful and appreciative, for, unless a teacher lives out of town, it is well-nigh impossible for her to get material for her lessons, much as she knows it is needed, and much as she would like to have it.

In addition to maintaining the nature rooms and distributing specimens to the teachers for their classrooms, the League works from still another angle by means of spring, fall, and midwinter "shows" which it holds every year, each time in a different school, and usually where there are no facilities for a permanent nature room. These exhibitions are frequently arranged in some part of the playground. The spring and fall shows continue for three or four days, the midwinter one of evergreens, nests, shells, mosses, fungi, etc., for ten or more days. During 1919 more than 10,000 children representing 16 different schools visited the shows and had at least a glimpse of a new and wonderful world. As in the nature

rooms, all specimens are plainly labeled, and they are grouped under such headings as "wild flowers," "garden flowers," "flowers that make fruits good to eat," "mosses and ferns and their relatives," etc. Usually the first exclamation is "How good it smells!" and little noses are buried in the blossoms for a more satisfying sniff. The children look at us so wistfully when we tell them about the woods and fields in which we gathered the specimens, and which many of them have never seen. After a visit to one of the shows one boy wrote that he just wished he could live in the country and see these things every day. The Spring Show which has just been held was the fifty-eighth exhibition. When the show was broken up and everything that had survived the three days' exhibition was sent to the classrooms, one little girl said her room looked so pretty that she didn't want to go home.

It is evident that a vast amount of material is continually needed for the nature rooms, the flower shows, and for distribution. This is provided by the officers and members of the League and their friends, by children of country and suburban schools, Scout Troops, chapters of the National Plant, Flower, and Fruit Guild, the city parks, Botanical Garden, etc. The American Museum has been our most constant and loyal supporter, and we have met with coöperation on every side, from superintendents and principals and from the libraries, the Aquarium, and park officials. A number of camps also made fine collections for us during the summer. Why should not the city parks grow specimens for the schools in quantity as a regular part of their work and the museums turn over to the schools any imperfect or unusable material? To provide the nature is a large problem, but the results are surely worth working for.

After three years' experiment with our nature rooms we feel that they really can solve the problem by which, even in the heart of a great city, nature can be made to mean something to the city child and become a real part of his life. Moreover, we have proved that he eagerly welcomes this kind of knowledge and that it brings him something no other subject can. As one principal put it, "I consider nature study, taught in this way, one of the most valuable in the whole curriculum because it, almost alone, touches the spiritual side of the child."

What we have done is just a beginning; there should be a nature room in every school. There is nearly always one nature enthusiast among the teachers who would take charge of it—and there should be a competent director of nature study appointed just as there is now a director of sewing, drawing, music, or cooking. Why cannot this great city which is looking after the child's physical well-being, his eyes, his teeth, his lunches, also remember that "man does not live by bread alone," that these children long to see and learn about the beautiful things of wood and field, that they too would gladly sit at the feet of Mother Nature and learn some of her secrets. Do we not owe them at least a peep into nature's fairyland before they are engulfed by the great city, and become too sophisticated to want it?

Moreover, there is a very practical side to this work. One of the crying needs of the times is "more people on the farms." Why neglect the opportunity then to interest the children in the wonderful and beautiful things of nature when they are at the most impressionable age, so that they will be glad to live in the country when they grow up? One boy who often visited the nature room confided to his teacher that when he grew up he wanted to be a scientist and live in the country where he could see and learn all about these things. Why should not the nature rooms prove laboratories for the making of scientific farmers? Is not the experiment worth trying?

The Manufacture of Pulp and Paper as an American Industry

By HUGH P. BAKER

Secretary-Treasurer, American Paper and Pulp Association, New York City; formerly Dean of the New York State College of Forestry, Syracuse University

THE manufacture of paper as a human activity ranks in age second only to the manufacture of textiles.

Not, however, until the printing press in a crude form came into use, and books were made, did there arise any demand—any need—for the making of paper so that it might be used commonly. It is rather peculiar, possibly, that even with methods of paper manufacture known for thousands of years, it is a matter of only a few hundred years that the paper mill has been known. In this country three or four human generations indicate the age of the manufacture of paper as an industry.

Not until the development of the modern newspaper and the perfection of methods in the production of cheap editions of books, did there come the demand for paper that has made its manufacture a great industry. Today we hear more of the demand for news print paper than for any other. There has been exceedingly rapid increase in its production, yet production has not kept pace with consumption. In 1899 the consumption of news print paper alone in the United States amounted to 569,212 tons; in 1918 the consumption was 1,760,517 tons, an increase of approximately 200 per cent. The per capita consumption of news print paper increased from three pounds in 1880 to thirty-three pounds in 1919.

Present Development of the Paper Industry

The paper industry is relatively undeveloped, and has tremendous possibilities in the ever increasing demand for paper of all kinds—a demand due both to increasing population and to increasing use of paper. The rapid development, in the last five years, of the use of the paper carton or box in the shipment of all sorts of materials is indicative of the way in which we may expect the industry to grow with the coming years.

The manufacture of news print paper depends largely upon an available supply of wood of the right character, and yet but from 7 to 8 per cent of the total of the wood produced annually from the forests of the country goes into the manufacture of paper. The production of paper, then, is not largely responsible for the disappearance of our forests.

The last few years have seen the development of larger and more efficient paper mills, but we have not yet reached in the development of the paper manufacturing plant the high point attained in a similar direction in the lumber industry. The well-equipped paper mill involves great initial expense. For instance, the paper mill producing news print paper in an effective way may cost a million and more dollars, and it is not a simple thing to move this plant with the disappearance of the forests, or with the increase to the prohibitive point of the cost of transportation of wood. The result is that there is no industry more dependent than this upon the permanency of our forests, or upon the renewal of forests on lands which have been denuded.

The Paper Industry and the Forests

The possibilities of development in the industry in the way of manufac-

ture of news print, fiber, and box board, wrapping papers, and the like, are such that a constant supply of wood from the forest in the future is necessary. The woods most commonly used have been spruce, fir, hemlock, the cottonwoods or poplar, and some of the hard woods. Light-colored, nonresinous, long-fiber woods that can be produced with comparative ease, and that require little or no bleaching, are best adapted for ground wood pulp. These requirements are met most effectively by the various spruces grown in this country. More than 84 per cent of the total pulp manufactured in 1918 was made from four species of woods in amounts as follows: spruce 55 per cent, hemlock 16 per cent, balsam 7 per cent, and poplar 6 per cent. Some of the pines and various hard woods, such as beech, birch, and maple, have been used by the mills in this country for a considerable time. It is probable that much more hard wood will be used in the near future than has been used in the past, not because the hard wood is especially adapted to the manufacture of paper, but because it is available where the supplies of soft woods such as the spruce and fir, are rapidly disappearing.

The solution of the problem of future supply of woods for the paper mills of this country lies in the more sensible use of the virgin forests which still exist, and aggressive reforestation and development of forest lands not now producing forests. There is enough potential forest land in the states east of the Mississippi to produce forests of soft woods that would not only give an annual crop large enough to take care of the manufacture of the paper needed in the United States, but would also make the United States a great export nation of paper—as well as of other products of the forests.

The American Paper and Pulp Association has put itself on record in such reforestation work through its Committee on Forest Conservation. It must do more than put itself on record. It must carry on a campaign of education that will not only interest other industries dependent upon the forests, but will also show the people of the United States that it is to their advantage to make permanent paper manufacturing, lumbering, and all other industries dependent upon wood by attention to the permanency of the forests; it must get back of a movement that will reforest not a few thousands of acres a year, but millions of acres.

Solving the Problem of More Paper

There is one word that can be used to indicate the solution of the problem involved in producing more paper in America, and that is—education. Education within and without the industry is fundamental to keeping it in its present place or pushing it still farther forward among the great industries of the country.

The future of paper manufacturing and of other industries dependent upon the natural resources of the country rests very largely upon the effective education of the general public as to the needs and the aims of the industry. Let the public know something of the problems involved in the manufacture of paper. Let it know more and more of the importance of paper in daily life. See that the people realize that the industry is interested in the conservation of natural resources, that the welfare of the entire public depends not only upon vast natural resources, but upon the efficient use of these in the upbuilding of industry and trade. Is there any department of the government, any educational institution, any group of people anywhere in the country more interested in the permanency of supply for an industry than the industry itself? Why should the paper industry, dependent upon the forests

and upon other raw materials, depend upon the federal government or upon educational institutions to conserve natural resources that make for the permanency of the industry! Beyond a question it will be money well invested if the industries will carry on militant coöperation and aggressive coördination of effort, making for the conservation and efficient use of the natural resources of America.

Organizing for the Production of Paper

The paper industry has felt itself to be efficiently organized for production and yet there seems to be room for improvement. There is more in organizing for production than merely increasing the output of a particular machine or of a particular mill. There have been mills which organized for production and increased their output by increasing efficiency within the mill, without paying any attention to the permanent supply of raw materials which would keep the machines running at highest efficiency, or without considering the marketing of the products in such a way as would make the increased efficiency in the mill worth while.

Organizing for production today goes away beyond merely increasing the productiveness of a single machine or of the mill. There should be organization to make permanent the supplies of raw materials of all kinds, not alone that we may have more wood, or more rags, or more jute, but that we may produce our own dyes, our own clay, our own alum. The American Paper and Pulp Association has taken a very definite stand for conservation, but it should go further than the mere printing of a program. It should have a "woodlands division" made up of representatives of every mill owning woodlands. It should have a committee dealing with the problems of raw materials other than wood, and with the problems of standardization within the industry.

After forty years of an American Paper and Pulp Association the industry waited until 1919 for the formation of a Salesmen's Association. This association should be strengthened because it is vitally important that the products of the mills be placed upon the market as efficiently as they are manufactured. There are untold possibilities in the way of uniting various spasmodic and separate efforts to educate the public as to the use of paper products. What has it meant to the industry to educate the people to use paperboard boxes as containers? What tremendous development there has been in using wax paper on food products! Is anyone willing to say that we have gone as far as we can in extending the use of paper? How much more effective would be organized effort than the expensive individual effort that occurs here and there through the country at the present time.

There are certain laws underlying the development of any industry. The officers of the American Paper and Pulp Association will come and go, but the principles of the development of the organization will remain the same. As there is truth in the patriotic statement, "In union there is strength," for the state or the nation, strength in the development of an industry also will result from unified effort. Effort there will be on the part of every manufacturer of paper; unified effort will be more difficult, and yet it comes, and will come, and as the result of it we shall not only make the paper industry take its place aggressively with the other great industries of the country, but, because of what we can and will accomplish in the struggle for the conservation of our natural resources, the industry will also be a vital factor in the welfare of the American people.

The Wood-pulp Shortage

CURTAILMENT OF PRINTING AN INEVITABLE RESULT

By WILLARD G. VAN NAME

Department of Invertebrate Zoölogy, American Museum of Natural History

THE shortage of material for paper making and the apparent absence of any commercially practicable source for paper pulp except the wood of our rapidly disappearing forests is one of the problems of the present time.

From the commercial and industrial aspect, it is only necessary to look ahead two or three decades at most; the lumberman and the paper maker are in business for one purpose only, to earn money, and money to be obtained now or five years from now, is of vastly more importance to them than a serious crisis in the industry twenty-five or thirty years from the present when others will have to meet the losses and difficulties. Even the chief consumers of paper if forced to choose either cheap wood pulp for the next ten or fifteen years, followed by a paralyzing scarcity at the end of that period, or an *immediate restriction of production* in order to insure a permanence of the supply, would probably choose the former alternative. From their point of view, that of making money, they might be right. Yet this would not be the best solution for the public in general. The nation and in fact the whole civilized world is vitally interested in maintaining a sufficient supply of paper for its present necessities and future progress, and if our extravagant use of wood pulp is consuming the principal of the supply and not merely the interest (which is limited to the annual reproduction under the best practicable forestry methods), a crisis, not only in the paper industry but in every activity dependent on the extensive use of paper cannot be indefinitely postponed.

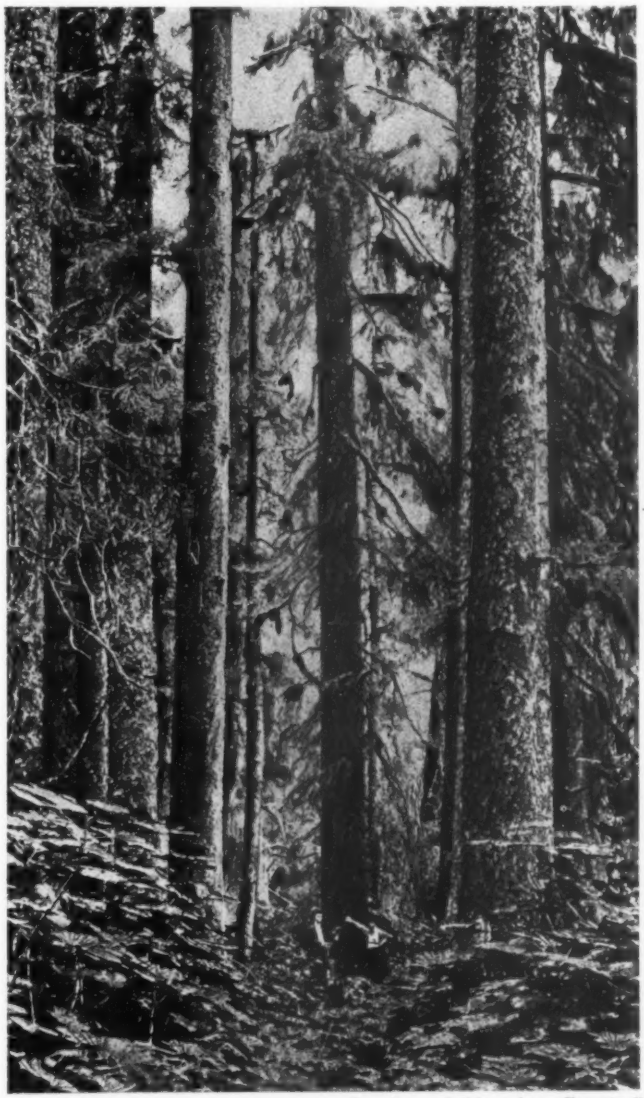
Scientific forestry and artificial reforestation may solve the lumber problem of the future to an extent that will enable us to get along, but they never can more than somewhat moderate the inevitable shortage of pulp wood. The reason is that for the latter purpose very small and young trees can be and are used, resulting in completely stripping the ground. There can be very little selective and scientifically conducted cutting, especially now, when the high price of labor makes it very costly to go over the same ground more than once.

One of the chief reasons for the poor success of many forestry operations in this country has been that the most essential factor in the growth of trees is neglected both in theory and in practice. It is not trees alone that constitute a forest; the soil from which the trees grow is even more important; if the latter is kept in proper condition and sufficient in quantity, the tree growth is rapidly reproduced. But by such stripping of the land as the pulp-wood industry causes, there is exposed to the sun, wind, and rains the soft spongy covering of the ground—vegetable mold and decaying leaves and branches with comparatively little mineral matter, a mixture that is the most essential factor in maintaining and restoring forest trees. When this is baked and hardened by the sun, or reduced to dust and blown or washed away by the winds and storms, the growth comes almost to a standstill, and real progress toward reforestation is impossible until, after a long period,

proper soil conditions have again gradually developed. There are no forestry methods other than such as involve prohibitive expense that can avoid this disastrous result of the wood-pulp industry, and it follows from this that reforestation will be very slow, and still slower after each and every subsequent cutting.

Another serious economic aspect of the subject is the use for wood pulp (in the northwestern states particularly) of much fine large timber that within a few years will be very badly needed for lumber. Present industrial conditions render this financially profitable, but the serious economic mistake of using trees that it has taken several centuries to produce, for purposes for which young growth of a few years of age could be employed, needs no demonstration. We shall pay dearly for it.

There appears to be no way of avoiding the conclusion that the shortage of wood pulp and the era of expensive paper have come to stay; if the opening up of new sources of supply relieves prices at all, it will be only a very brief and temporary respite. There is no alternative to the necessity of cutting down our present extravagant use of the product. The sooner we begin the less we shall suffer later on.



Courtesy of "American Forestry"

Pure stand of Alaska spruce in the Tongass National Forest, recommended for grinding into paper pulp. In the past, lack of foresight has allowed devastation of American forests of many hundred years' growth for pulp wood which requires only small trees and second growths or even the waste from lumbering. Shall we now allow pressure of economic conditions force a continuation of such sacrifice? Will not curtailment of printing, for instance of *display advertising*, for a period of years, by means of a graduated tax, save many thousands of acres of forest with no detriment to industry? Meanwhile, young forests on denuded or waste land, particularly in the neighborhood of large paper mills, can be pushed to produce an adequate supply of pulp wood

How is the use of paper to be cut down with the least inconvenience to the public and least interference with business and educational progress? Can it be made anywhere with greater saving and less loss to the nation than by suppressing the present destructively competitive advertising that almost eats up the profits of many branches of industry and is responsible for expanding our magazines and newspapers to a size that makes them an inconvenience to their readers, a tax on our overburdened transportation facilities, and an enormous waste of wood pulp?

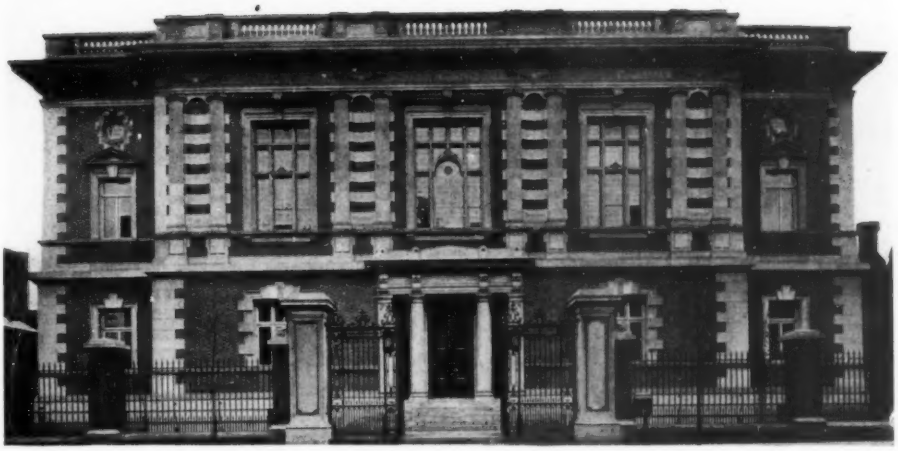
Advertising is a necessity for modern business. Even advertising to create a demand, not merely to assist in supplying it, is legitimate and must be provided for. But much of the advertising that is done today has no such purpose. Is a single additional automobile tire sold because of the many acres of forest that are sacrificed each month to provide full-page advertisements in the magazines and Sunday or daily papers, or in printing the reading matter that is used to "float" this excessive advertising? The only result is to divert trade from one manufacturer to another. The public and the nation will pay and are in fact already paying for the cost of these needlessly expensive and wasteful display advertisements which are necessary only because some other manufacturer or dealer has them.

Were this extravagant form of competition to be kept within bounds by a federal tax on all printed advertisements above a certain size, the volume of trade would hardly be appreciably affected, since smaller advertisements would then be as effective as the large and ever-growing ones are now. A tax on advertising is no new proposition but has been employed in many countries. In Italy, for instance, before the war, and probably still, a revenue stamp was required on many forms of advertisements, even those placed inside a store window so as to be seen from the street. Small notices serving as a medium between the manufacturer, dealer, and purchaser are not merely a convenience but a necessity to all parties; they should, of course, not be taxed at all, for the tax should be levied primarily as a conservation measure, not for revenue, or for the latter only secondarily; but the large display advertisements for which the public has to pay the increased prices, and which is one of the main causes of the present paper shortage, could be greatly reduced by a graduated tax increasing rapidly with the size of the advertisement.

Yet today we are doing exactly the opposite. The government is not restricting but is encouraging extravagant advertising. The public is being heavily taxed to provide cheap mailing rates for advertising matter (many of our magazines and newspapers are little else), and our railroads, unequal to the transportation of necessities, have this additional and unprofitable burden placed upon them.

Any restriction of advertising will probably be bitterly opposed by nearly every magazine and newspaper in the country, since for many it has been the source of their chief or only profit, and will probably also be opposed by most advertisers; but with the evident impossibility of continuing the output of printed matter on the present scale, it is possible that the subject may soon be regarded in a different light.

A curtailment in the use of paper and other wood-pulp products is unavoidable. If it is not made by intelligent regulation of the less important uses of the material, the educational and scientific progress of the nation is certain to suffer from the prohibitive prices which will soon prevail.



Façade of the new hall of the College of Physicians of Philadelphia[1]

The Library of the College of Physicians of Philadelphia

By W. W. KEEN, M.D., LL.D.

A former President of the College[2]

THE "College of Physicians of Philadelphia"—the legal name of the institution—is not a teaching college. It has no faculty. Its members are "Fellows." It has no power to grant degrees. The term "College" is used in the old Roman sense, that is, a collection or society of colleagues. One sees the medical use of the word in the "Royal College of Physicians" and the "Royal College of Surgeons" in London, Edinburgh, and Dublin, and its similar ecclesiastical use in the "College of Cardinals" assembled for the election of a new Pope.

At its monthly meetings, scientific communications are read and from time to time special scientific lectures are delivered by distinguished medical men of this and other countries.

The college was founded January 2, 1787, by Drs. Benjamin Rush, William Shippen, Jr., John Redman, John Morgan, and nine others. It is therefore the oldest medical organization in the United States, except the New Jersey State Medical Society; of its kind it is by far the oldest one in this country.

This brief sketch concerns its Library. We must pass by for the present its other public services in active coöperation with similar bodies and with public officials, its scientific investigations as to public hygiene and the health of the community, the important scientific papers read before it and published in its many volumes of *Transactions,* and its services to the community through its free Directory for Nurses.

[1] For a full story of the origin and development of the College of Physicians see the pamphlet "An Account of the College of Physicians of Philadelphia." By G. E. De Schweinitz, President of the College, 1912. J. B. Lippincott Company, Philadelphia.

[2] Dr. Keen is President of the International Congress of Surgery, meeting in Paris, July, 1920.

At present the Library consists of 125,000 books, 112,000 as yet unbound pamphlets, besides many exceedingly rare books of which more anon. It is growing at the rate of more than 3000 volumes annually. Except the Library of the Surgeon General of the Army in Washington, the largest in the world, it is the largest and most important medical library in the United States. It ranks about fourth or fifth in size in the world.

No other medical society in Europe or America has so beautiful, commodius, and stately a home as the College of Physicians of Philadelphia. The present building is 108 feet front by 150 feet deep on a lot 130 feet by 180. It is surrounded on three sides by streets and by a beautiful garden on the fourth side, thus giving us light, air, and protection from fire. The building itself is fireproof. It was dedicated in November, 1909.

The Library had a very modest beginning in June, 1788, when Dr. John Morgan gave to the college *twenty-four books*. Its early Fellows were good Grecians and Romans—as became graduates of Edinburgh and Leyden, as many of them were—and through them and by later gifts and purchase, our Library is rich in the early classics of medicine in Latin and Greek.

The Library provides first of all for the needs of the *working doctor*. Hence it keeps up with the advances of medicine and surgery by large monthly additions to the Library and by taking (before the war) 1200 medical periodicals. The war made sad ravages among these periodicals but we are beginning to recuperate. We exchanged publications—again before the war—with 31 foreign universities. The reëstablishment of these exchanges is gradually taking place.

Besides being a working library for the busy physician and surgeon and his daily problems, it has always been our wish to have it a *scholar's library*. Hence we have made a point of procuring medical incunabula, that is, books printed before 1501. The dates of some of the earliest are uncertain as there were at first no title-pages as in our present books, with the title of the book, the name of the author, and the date and place of publication. In fact, at first, there was no consecutive numbering of pages or even of leaves. Later each leaf was numbered consecutively and later still, each page. Later also, at the end, the year and even the day of the month when the book was finished were printed, together with the name of the author and sometimes the mark or design adopted by each printer. The earliest printed medical books date from about 1468. The College Library is rich in possessing 262 of these incunabula and we are adding to our collection from year to year.

Among rare books in our collection is a perfect copy of Harvey's book on the circulation of the blood (*De Motu Cordis et Sanguinis*), published in 1628. Of the forty-two editions of the five works of Harvey the Library of the Surgeon General and that of the College of Physicians are the only libraries in this country or in Europe possessing thirty-three each.

Another rare book is the first printed edition of Celsus (Florence, 1478) with the signature of a former owner still legible—the paternal uncle of Americus Vespucius whose name the New World bears. Another bibliographical treasure is a superb copy of the works of Aristotle in Greek, an Aldine first edition, printed in Venice in 1495–98. Besides these we have some medical books in Chinese, Japanese, Siamese, and Turkish.

One of the especial archæological treasures of the Library is an Assyrian medical tablet, 9 x 14.5 cm.; its presumable date is about seven centuries

B. C. It has a cuneiform text on both sides. It is one of four such tablets, two being in the University of Pennsylvania Museum of Archæology and one in Constantinople, respectively. The Louvre has none.

It was the private possession of a man who was probably a high priest and a medical man. The treatment of disease in those days was purely by symptoms. Headache, then as now, was a very frequent symptom. Its cause was supposed to be a demon or spirit which it was the duty of the doctor to drive out. What more reasonable than to apply poultices or ointments to the head and keep them there for a number of days as is here recommended? [1]

We have also ten thousand portraits of physicians, each available in a few minutes through a card catalogue.

One peculiar and peculiarly useful feature of our Library is twelve small study rooms. Any Fellow engaged in writing an important paper or book requiring literary research, can engage one of these rooms, if one is free, gather his books and papers together, dictate to his stenographer without disturbing others (for the walls of these rooms are of brick and not of lath and plaster) and when he leaves there is no putting away of books and papers or reassembling of them when he returns. When next he comes everything is there as he left it. This saves much loss of time to the author and much wear and tear on the books.

Such a library and such facilities for its use invite to literary activity. Accordingly, for a number of years about ten per cent of our active Fellows, who number 422, have either written or edited a new book or issued a new edition of an earlier one. Such a record is, I suspect, unique.

[1] Jastrow, *Transactions of the College of Physicians of Philadelphia*, 1913. With photographs, transliteration and translation.

Our card catalogue is entirely typewritten and is kept up-to-date.

So large and active a library requires a considerable staff of librarian, assistants, cataloguers, and messengers. All these activities cost money.

We have been unusually fortunate in having gathered from time to time a special "Fund for Completing Files of Journals," another for "Rare and Valuable Books," and a "Catalogue Endowment Fund." But our principal income for the many activities and expenses of the Library comes from nearly thirty Funds given by Fellows and friends of the College.

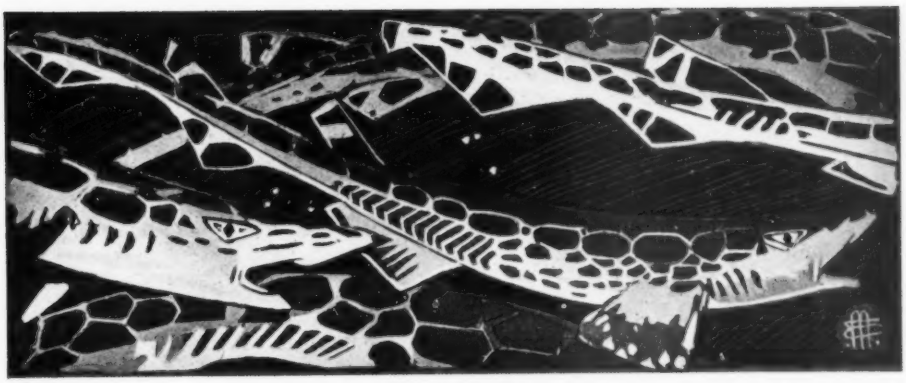
Despise not the day of small things. How great a fire a little matter kindleth! Those twenty-four books of John Morgan were prophetic of the present thousands upon thousands.

Let not only doctors but communities take courage and *start* a library no matter how small. It will gather friends and funds as a snowball gathers unto itself more and still more snow. Even in 1867 when I was elected a Fellow, the Library was of minor size and minor value and open only a few hours each week. A half century has metamorphosed and invigorated it until now it is open all day and two evenings each week. It is of enormous value to the profession, and through the doctors, who thus are better educated and kept posted up to the very last discovery, it promotes the health and happiness of the entire community. Its use is not restricted to the Fellows of the College. Any doctor and even any one seeking information on a medical subject has this splendid Library at his service upon a proper introduction by any Fellow. It is constantly visited and its treasures utilized by doctors from all over the country, who find in its great resources and the quietude of its study rooms the greatest possibility and encouragement to work.

After Méheut

A STUDY OF SCULPIN STRUCTURE

Suggesting the artist's careful work on the fundamental anatomy of his subjects.—The drawing, made from the dried fish, emphasizes the immense size of the compressed head of this species, brings out the head spines which show obscurely in the living fish (compare with drawings on page 290), and depicts with especial value to the sculptor the planes of the external surfaces of the fish



A very handsome decorative adaptation of the spotted dogfish (note the effect of the triangular eye)

Undersea Forms of Life[1]

Their beauty of line and color and adaptation to purposes of art

By CHARLES R. KNIGHT

American painter and sculptor of animals

THE French artist, M. Méheut, whose books form the subject of this brief review, is evidently a man of great ability with a strong love for his particular work and a manifest desire to make it of use to those who may be interested along similar lines. As a draftsman he shows extraordinary facility and is able to record with accuracy the various forms and attitudes of a host of strange and beautiful creatures found beneath the surface of the sea.

One feels on looking through the pages of these fascinating volumes by M. Méheut that here have been presented to us for the first time really adequate pictures of these denizens of the ocean in all their richness of design and color, and that the artist never loses sight of the decorative possibilities of his subject. Indeed, it is from the latter viewpoint that the drawings will prove of greatest value to the art student's work. In some of the plates the structural details are minutely and accurately depicted, while in others more attention is given to the divers postures and attitudes assumed by the living creatures when feeding, swimming, or resting.

M. Méheut must have expended in many instances a great amount of skill and energy in grasping the salient facts of the poses assumed by various creatures during a very brief period of time. This is especially true in the case of some of the higher forms shown in his plates. The writer has had wide experience in this very field of art and does not hesitate to say that anyone who has so charmingly placed upon paper the numberless attitudes of fishes, crustaceans, and the like, shown in these volumes, must indeed be a master at the game. Take for instance the picture of the blenny, a bottom-living fish found about the French coast. How lifelike is the attitude of the little creature as it sits like a bird upon the sand, supported by the two pectoral fins. One feels instinctively that the drawing is correct, the proportion and the perspective excellent and very difficult to reproduce. How graceful and vivid, too, are the drawings of the great conger eels and the spotted dogfish. They give at once a

[1] *Étude de la Mer*, Faune et Flore de la Manche et de l'Océan. Vols. I–II. Par M. Méheut. Texte par M.-P. Verneuil, Préface par M. Yves Delage, Membre de l'Institut. Librairie Centrale des Beaux-Arts, Paris, 1918.

The illustrations of this review are reproduced from Méheut's drawings through the immediate courtesy of Albert Lévy, Éditeur, Librairie Centrale des Beaux-Arts.

sense of power. But it is just this phase of art which is not easily portrayed, for in order to catch such movements one must draw with great speed and proficiency, else the result will be merely a series of meaningless lines. The Japanese artists are supposed to lead the world in this sort of drawing, yet no Japanese has, to my knowledge, been able to catch these fleeting attitudes with so much fidelity. To our Oriental friends, however, must be given the credit of working along very similar lines, and for that very reason they have produced some wonderful drawings in the way of decorative renderings of animate things.

Our artist has given us at intervals through his books suggestions for the adaptation of the types he presents, and I wish to call the art student's attention particularly to these suggestions. In the plates of the various species of skates and rays, as well as in those of the species of crustaceans, one sees at a glance the decorative quality contained therein, and the conventionalized pattern of the fishes themselves is full of color and variety. Too many of our art students, I fear, never learn the immense value in this sort of study—and how characterless and tiresome their work seems without it.

Again in the squid and the octopus drawings much care has been taken to show not only the wonderful curves of the tentacled arms and the strange and sinuous character of these villainous-looking creatures, but the marvelous protective coloration of spots and stripes also comes in for its full share of attention. In other words, M. Méheut in each case gives us, first, splendid studies of the living animal as a help to students in modeling and drawing, and second, a series of color or wash studies in which the complicated and suggestive color patterns are carefully worked out. With these as a guide the interested student is able to acquire a knowledge of exterior anatomy which will enable him to produce virile, interesting, and anatomically possible types for his decorative work, whatever it may be, as well as a wealth of suggestion for color work in design for dress goods, wall paper, or the thousand and one other art expressions to which his fancy or his necessity may lead him.

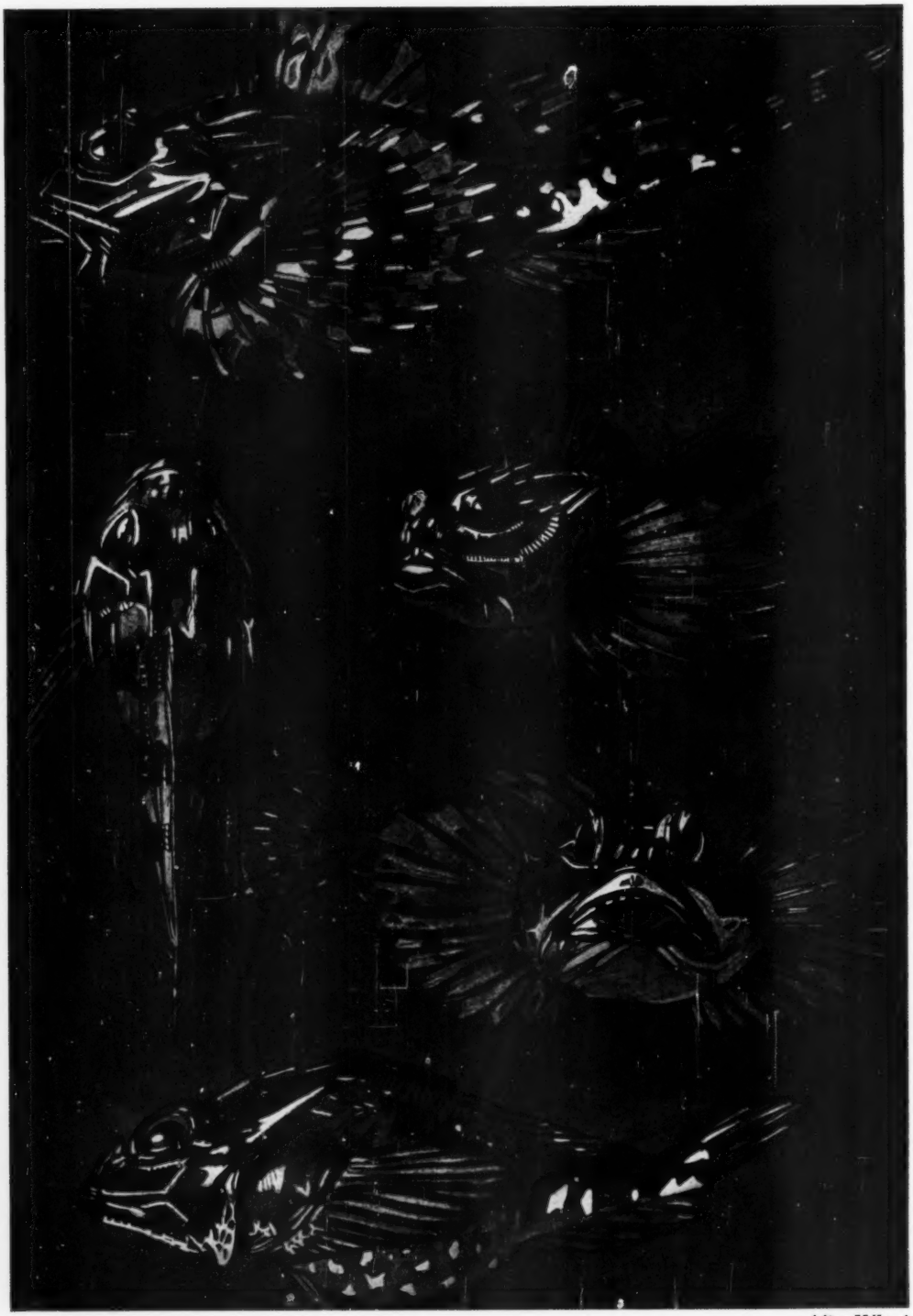
The volumes, as a careful perusal will show, contain hundreds of drawings of crustaceans, mollusks, and seaweeds, all done in the same splendid manner and all filled with the same spirit of life and animation. It is safe to say that the books are a revelation to the art student as well as to the layman, and should prove of inestimable value to a great number of people who, through lack of interest or opportunity, have not hitherto been aware of this particular phase of nature's wonderland.

Study of a characteristic life pose: a blenny (*Blennius gallorugine*) resting on its fins in a position suggesting a butterfly

DECORATIVE QUALITY IN THE PATTERN OF CRABS

M. Méheut's work is particularly worthy of appreciation by students. He has lost no opportunity to give freely to his fellow artists the application as he sees it of the forms and patterns of undersea life to decorative purposes. This page suggests the similarly fine work of the Japanese

After Méheut



After Méheut

LIFE STUDIES OF THE SCULPIN

Accurate structure and life postures, yet decorative in effect.—M. Méheut gives many pages to life studies of this "bullhead of the sea"—in profile, head on, aggressive, in repose, lying in wait under the rocks "like a brigand in his cave," alert with fins bristling guarding the eggs. The page devoted to the color and color pattern of this species is one of the most effective pieces of work in the two volumes

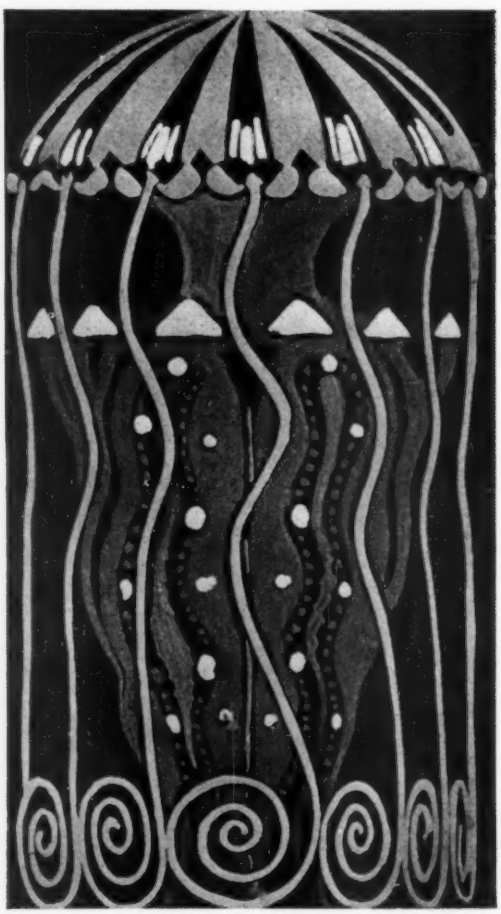
FLAT COLOR DECORATION FOR TEXTILE DESIGNERS

The artist here calls attention to the wonderful decorative quality in the color patterns on the backs of certain species of rays—fishes of the sea bottom. It is unfortunate that we cannot reproduce the color plate portraying the decorative quality of skate color patterns. Such patterns are most charming in effect but are drawn with difficulty. The rays, like the sculpins and the blennies, served the artist as inspiration for many pages of suggestive studies.

On looking through the fascinating volumes one feels that here have been presented to us for the first time really adequate pictures of these denizens of the ocean in all their richness of design and color

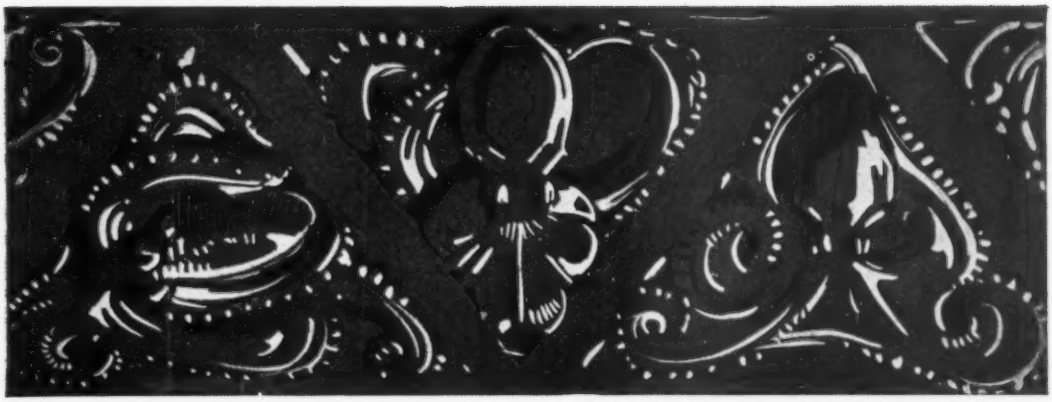
After Méheut

Decorative application of the goose barnacle (*Lepas anatifera*) by M. Méheut



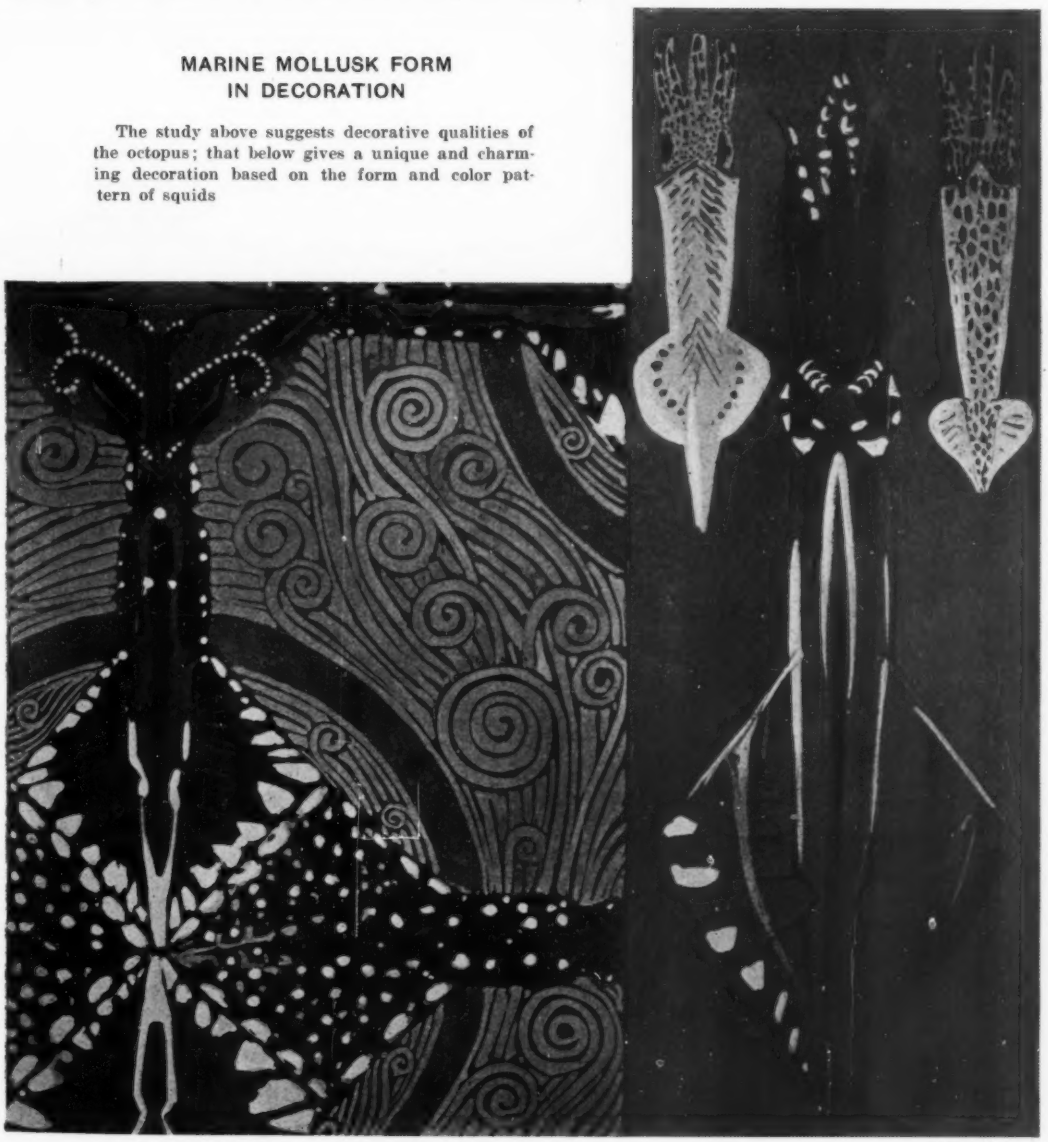
Drawings after Méheut

Adaptation by M. Méheut which brings out the decorative quality in the form of the jellyfish. The study at the right is especially applicable to painting and flat surfaces, that at the left to sculpture

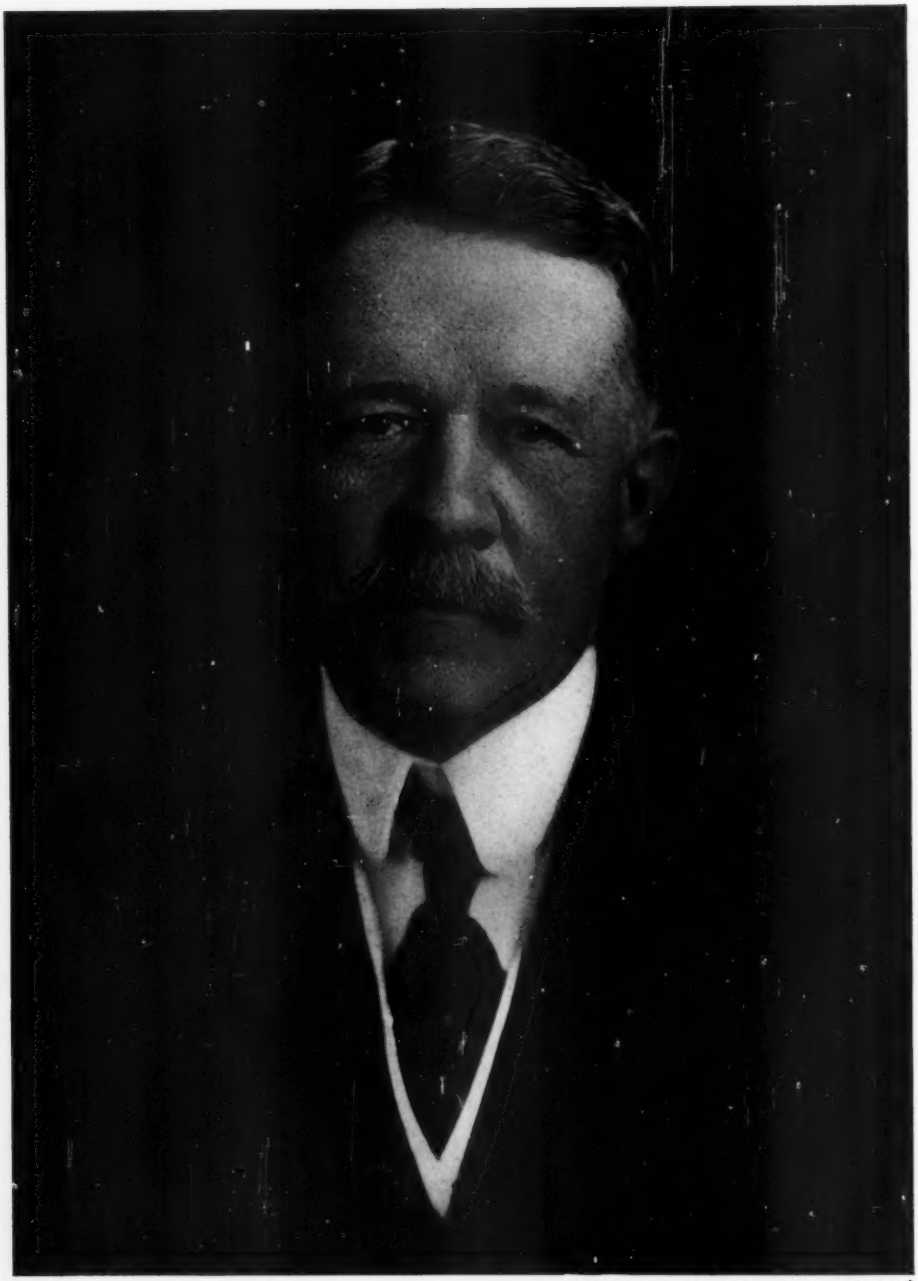


MARINE MOLLUSK FORM IN DECORATION

The study above suggests decorative qualities of the octopus; that below gives a unique and charming decoration based on the form and color pattern of squids



After Méheut



Courtesy of Underwood & Underwood

THE CREATOR OF A PEOPLE'S PLAYGROUND

George W. Perkins has an imperishable monument in the Palisades Interstate Park, a recreation ground of 35,000 acres which is a partnership between the states of New York and New Jersey for the people on a noncommercial basis.

In 1899 the Palisades along the Hudson opposite New York were being destroyed by quarry interests. The late Theodore Roosevelt, who was then Governor of New York, appointed a commission with George W. Perkins as president, to coöperate with a commission appointed by the Governor of New Jersey. Mr. Perkins' first step was to buy an option on the quarry interests with the $10,000 granted the commission at the time of its appointment "for expenses." The late Mr. J. P. Morgan gave the $122,500 needed to buy the property and on Christmas Eve, 1900, the destruction ceased. The Palisades Interstate Park thus started as a conservation movement

George Walbridge Perkins, 1862-1920

By GEORGE FREDERICK KUNZ

President of the American Scenic and Historic Preservation Society

IT was in connection with the creation of the Palisades Interstate Park that George W. Perkins, who died on June 18, 1920, first came prominently into public notice. Previous to that time he had been taking an increasingly important place in the insurance world. Born in Chicago on January 31, 1862, and beginning as an office boy at $300 a year in the Chicago office of the New York Life Insurance Company, he had risen by the year 1900 to the position of chairman of the Finance Committee of that company, whose main headquarters were in New York. This brief statement is a sufficient indication of his business genius.

In order to understand the turning point in his career in 1900, at which time he not only enlarged his sphere in the financial world but also entered upon what may properly be described as his public activities, it is necessary to recall that for several years prior to that date there had been a growing agitation to prevent the mutilation of the Palisades of the Hudson River by trap-rock quarrymen who were blasting away the face of the cliffs opposite New York City for road-making material. Various plans for a state, interstate, or national park covering the Palisades area had been proposed, but without results. In 1895 an effort more determined than ever was made. In that year Andrew H. Green secured the incorporation of the American Scenic and Historic Preservation Society, whose charter authorized it not only "to acquire . . . historic objects or memorable or picturesque places," but also to "act jointly or otherwise with any persons appointed by any other state for similar purposes . . . whenever the object to be secured or purpose sought to be accomplished is within the jurisdiction of this and any other state or can only be attained by such joint action." This provision distinctly contemplated the preservation of the Palisades.

In the same year the Legislature passed an act for the appointment of a commission to confer with a like commission from New Jersey concerning the preservation of the Palisades. The plan then evolved was for a national park, and in 1896 the Legislatures of the two states authorized the cession to the United States of jurisdiction over the Palisades upon purchase by the Federal Government for a military and national park and for the protection of the cliffs, trees, etc. A bill was also introduced in Congress for the purchase of the land, but never passed, and this plan failed.

On June 17, 1899, Governor Roosevelt wrote a letter to Andrew H. Green, president of the American Scenic and Historic Preservation Society, asking him to appoint a committee of five to act in behalf of the state of New York in conjunction with the commission appointed by Governor Foster M. Voorhees, of New Jersey, to devise measures for preserving the Palisades. Mr. Green accordingly named Frederick W. Devoe, George F. Kunz, Frederick S. Lamb, Abraham G. Mills, and Edward Payson Cone as such commissioners. They engaged desk room at the headquarters of the Empire State Society of the Sons of the American Revolution, No. 1123 Broadway, New York City, and during the next seven months held frequent joint conferences with the New Jersey commissioners: F. W. Hopkins, Miss Elizabeth Vermilye, W. A. Linn, S. Wood McClave, and Miss Cecelia Gaines.

On December 12 of this same year (1899) the New York commissioners transmitted to Governor Roosevelt a report outlining a plan for the creation of the Palisades Interstate Park, and in his message to the Legislature, January 3, 1900, Governor Roosevelt said:

"The State should sedulously preserve for its people the natural beauties within its limits. Great good has been done by the Niagara Falls Reservation, and its interests should be advanced in every way. I call the attention of the Legislature to the report of the Palisades Commission, which has my hearty approval. The Palisades should be preserved. They form one of the most striking and beautiful features of nature in the entire country, and this marring and ruin should be a source not merely of regret, but shame, to our people. New Jersey is in real-

ity less interested in their preservation than we are, although they are in her territory, but their beauty can best be observed from ours.

"There are two miles of the Palisades in the State of New York and ten in the State of New Jersey. No further riparian rights along their base should be granted, and I suggest that a Commission to represent the State of New York be appointed, and that the Governor be empowered to request the State of New Jersey to appoint a similar commission to serve with ours and endeavor to provide for joint action by the two States to secure the permanence of this splendid monument."

On January 15, 1900, Senator Parsons, without the approval of the commissioners, introduced in the State Senate a bill providing that when the United States had acquired property for that purpose to the value of $250,000 or any part thereof, the state of New York should reimburse the Federal Government for its expenditure, but this bill was withdrawn when, on February 1, Assemblyman Gherardi Davis and Senator N. A. Elsberg, at the request of the American Scenic and Historic Preservation Society, introduced a bill "To provide for the selection, location, appropriation and management of certain lands along the Palisades of the Hudson River for an interstate park and thereby to preserve the scenery of the Palisades."

The Davis-Elsberg bill became a law (chapter 170 of the laws of 1900) on March 22, and soon after that New Jersey enacted a corresponding bill. On April 2, Governor Roosevelt named as five of the ten commissioners provided for in the bill, George W. Perkins, D. McN. K. Stauffer, J. Du Pratt White, Ralph Trautmann, and Nathan F. Barrett, of New York State. Governor Voorhees accepted these nominations and named Abram S. Hewitt, Edwin A. Stevens, Franklin W. Hopkins, William A. Linn, and Abram De Ronde, of New Jersey, as the other five. On May 18, 1900, Governor Roosevelt also appointed the latter as nonresident commissioners, thus completing the commission.

The commission, in its capacity as representing the state of New York, organized with George W. Perkins as president, a position which he retained until his death twenty years later. In recognition of the prompt, energetic and effective manner in which Mr. Perkins took up his task, he was elected a trustee of the American Scenic and Historic Preservation Society on December 1, 1900. On December 5 he requested the society to appoint a committee to confer with the Palisades Commission and this cordial coöperation of the commission and the society has continued ever since.

At the very beginning, Mr. Perkins brought his genius to bear successfully on the complex problem. His first object was to stop the destructive work of Carpenter's quarry. The property was held at $132,500. With the $10,000 appropriated for expenses he secured an option and set out to raise the rest by private subscription. He went to the late J. P. Morgan expecting to get about $25,000, and Mr. Morgan gave the whole $122,500. Blasting was stopped on Christmas Eve, 1900, and the first great step was accomplished.

It may be said here, parenthetically, that another result of this contact between Mr. Perkins and Mr. Morgan was an invitation from the latter to the former to become associated with him in business. The invitation was accepted and this important business connection continued for several years.

Since this original purchase of the quarry in 1900 the work of enlarging and developing the Palisades Interstate Park has gone forward with phenomenal success until the park area now embraces about 35,000 acres. During these twenty years the commission has received about $6,000,000 from the state of New York, about $600,000 from the state of New Jersey, and more than $6,000,000 in money and land from private contributors. Among the most generous of these contributors were Mrs. E. H. Harriman, J. P. Morgan, John D. Rockefeller, John D. Archbold, George F. Baker, Cleveland H. Dodge, Elbert H. Gary, Mr. and Mrs. Arthur Curtiss James, V. Everit Macy, James McLean, Frank A. Munsey, George W. Perkins, Henry Phipps, William Rockefeller, Mrs. Russell Sage, James Stillman, E. T. Stotesbury, and William K. Vanderbilt.

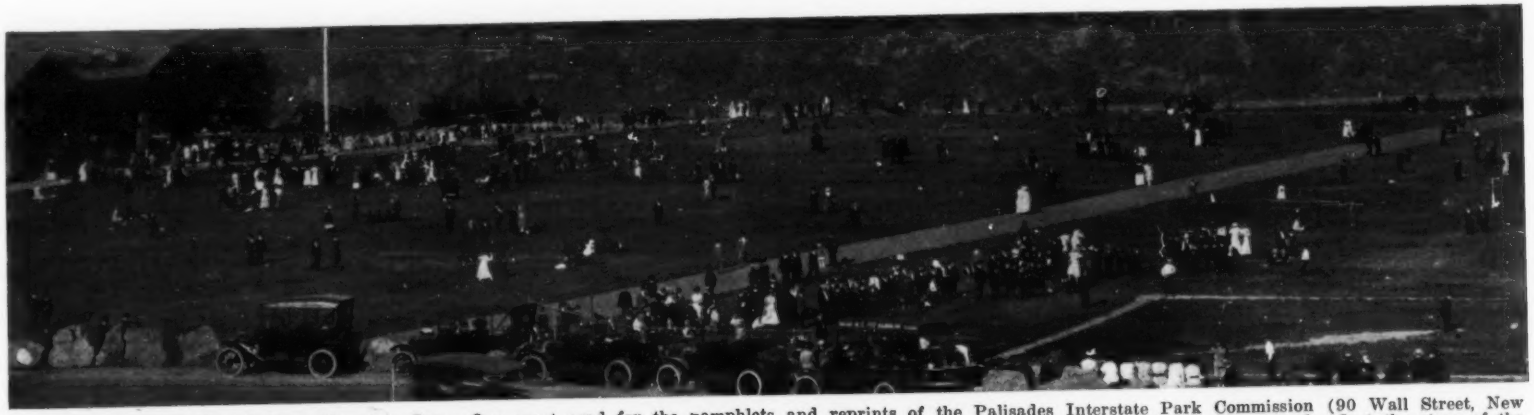
The Palisades Interstate Park was formally dedicated with ceremonies held at Alpine, New Jersey, on September 27, 1909, in connection with the Hudson-Fulton Celebration. In the absence of General Stewart L. Woodford, president of the Hudson-Fulton Celebration Commission, the writer officially represented the commission in the ceremonies. The Honorable Edwin A.

PLANNING FOR THE PARK

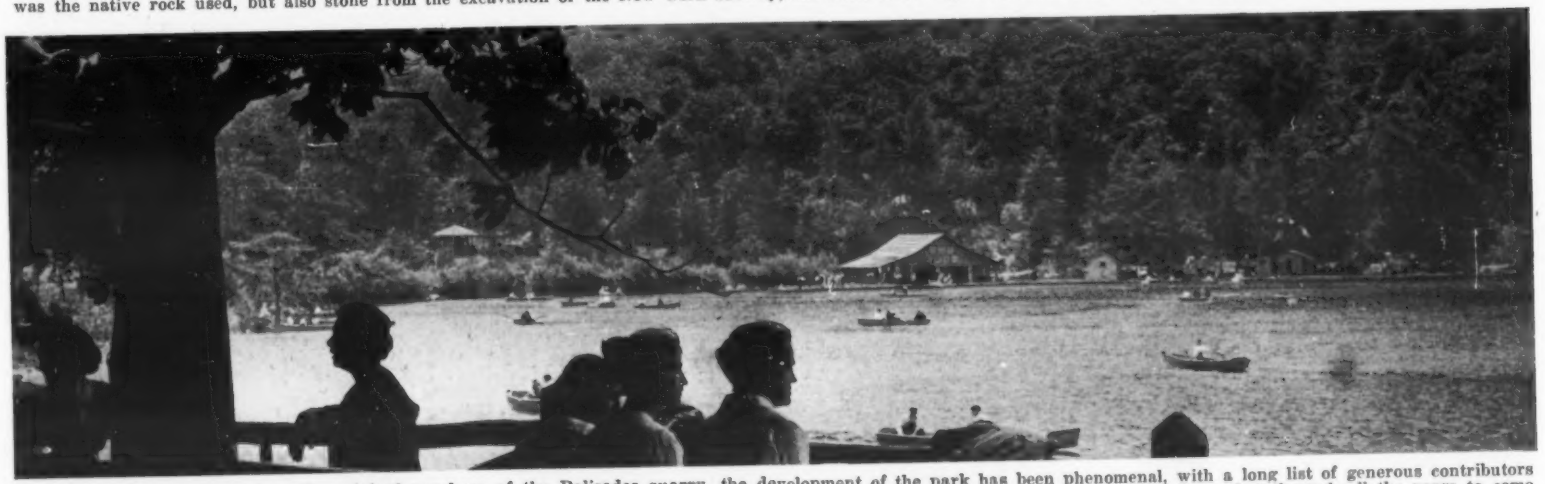
Mr. Perkins and Major W. A. Welch, chief engineer and manager. — They were optimists, willing to work hard for the end in view. "I never wavered one moment in my faith," said Mr. Perkins, "that although forty-five miles from New York, we could make this the most populous park in the world, because I knew that there were hundreds of thousands of tenement children in New York who needed an invigorating sojourn in these beautiful hills." Seven hundred visitors was the maximum for any Sunday the first year (1914); now there may be 40,000 for one day, in addition to those who are settled in the various camps

ALONG THE FOOT OF THE PALISADES

There are no artificial scenic effects in the Palisades Interstate Park. The natural and the historic have been left intact, except that way has been made for entrance and enjoyment. A twelve-mile trail leads along the shore between Fort Lee and the interstate boundary line. There are recreation pavilions and picnic grounds, wide beaches, a motor-boat basin, a bath house (2000 lockers), docks, free boats, camping grounds. The work has been done by the commission's staff of engineers with no letting of contracts, and, during the twenty years' existence of the commission, no commissioner has received any monetary compensation for his services



The "Playground" and Bear Mountain Inn.—One must send for the pamphlets and reprints of the Palisades Interstate Park Commission (90 Wall Street, New York City), and then visit the park, to gain any adequate idea of what has been accomplished in creating here a great free people's playground. Just the story of the construction of drives and trails, play fields, camp plateaus, and a wide beach opposite One Hundred and Fifty-eighth Street is a fascinating chapter of the work; for not only was the native rock used, but also stone from the excavation of the New York subway, the waste screenings from stone crushers, and the street sweepings of New York City



In the twenty years since the original purchase of the Palisades quarry, the development of the park has been phenomenal, with a long list of generous contributors (see page 296). Among the most notable gifts was 10,000 acres, with a contribution for its development, presented ("with the hope that through all the years to come the health and happiness of the generations will be advanced") by Mr. W. Averell Harriman acting for his mother and "in accordance with the long-cherished plan" of his father, the late E. H. Harriman

Mr. Perkins' chief interest was in the park's camp system which lay directly in the line of his ideal for social service. There are more than fifty standardized camps with mess hall and sleeping cabins, equipment for pure water supply and cleanliness, accommodations for swimming and boating and other out-of-door sports. There are Boy Scout, Girl Scout, and Y. W. C. A. camps, and camps for children from settlement houses and churches, and from such organizations as the Brooklyn Industrial School for Destitute Children. In connection with the camp life there are such educational features as camp libraries, lectures, concerts, motion pictures, and natural history exhibits

Mr. Perkins tells of the camps in his own words in *Motor Travel* (December, 1918), especially of Camp Globe where more than a thousand tenement children, averaging a stay of two weeks each, are entertained each season by the Association for Improving the Condition of the Poor in coöperation with the New York *Globe*. "I could go on indefinitely—it is my favorite theme—to tell you of these children, and how the Commission transports them the *longest way* over the mountains to thrill them with the auto ride; how they are watched over by kind, intelligent counselors; how they hike through the woods and learn the calls of the birds; of the food they eat, and the cabins in which they sleep through the still nights; about the lakes in which they swim and the boats in which they ride; the camp fires around which they sing." Through his energy and executive ability in building the Interstate Park, Mr. Perkins has prepared a controlling social power for the future

Stevens presided; the present Very Reverend Dean Howard C. Robbins made the invocation; Mr. Perkins, Governor Hughes, Governor Fort, of New Jersey, and the writer gave addresses. At the close of the ceremonies the United States flag was raised to a salute from the warships in the river.[1]

An interesting feature of the development of the park was the acquisition of the sites of Fort Clinton and Fort Montgomery lying respectively on the southern and northern sides of Popolopen Creek at its intersection with the Hudson River. This is at the extreme northern end of the Palisades Interstate Park about a mile north of Bear Mountain Inn. Some traces of Fort Clinton remain; and when evidences of the works of Fort Montgomery were found in the dense thicket which covered that site, the commission invited Dr. Edward Hageman Hall and Mr. Reginald Pelham Bolton, the former secretary and the latter a vice president of the American Scenic and Historic Preservation Society, to make an archæological survey of the fort site. This they did in 1916, having the coöperation of the commission's chief engineer, W. A. Welch, and also of W. A. Calver, a member of the society. Their researches, covering a period of several months, relocated the boundaries of the fort, which covered an area about a third of a mile square, identified more than half of the breastworks, with their numerous salient and reëntrant angles, and by vestiges and evidences too technical to give here in detail accurately plotted the whole outline. In many places they found the actual embrasures of the cannon. Within the fort they identified the foundations of the barracks of the Continental soldiers, the magazine, and other buildings, one of which was probably the headquarters of General George Clinton at the time when he was elected first governor of the state of New York in July, 1776. Since this survey, the Palisades Interstate Park Commission has had much of the underbrush of the fort site cleared out so that the old ramparts on the eastern and southern sides along the bluff overlooking the Hudson River and Popolopen Creek may easily be visited.

While the Palisades Interstate Park embodies Mr. Perkins' most memorable public work, he had many other public activities during the last twenty years. He was a warm admirer and close friend of Theodore Roosevelt and exerted a directing influence in the organization of the Progressive Party, of whose National Executive Committee he was chairman.

During the World War, he was chairman of the Finance Committee of the National War Work Council of the Young Men's Christian Association, and it was largely due to his consummate leadership that the great sums were raised throughout the United States for welfare work.

He belonged to a hundred or more financial, art, civic, educational, scientific, political, and benevolent organizations, his activities in or sympathy with which were an indication of the wide horizon of his outlook on human affairs.

All who came in contact with Mr. Perkins were strikingly impressed with his deep insight, his honesty of purpose, and his directness of approach to any subject. His energy and enthusiasm inspired in others the confidence he felt himself, and he was always the first to give of his money or time to any object that he endorsed. He "spared not himself," but gave of the best that was in him; and whether his immediate interest was the Palisades Interstate Park, the National War Work Council of the Young Men's Christian Association, or the many other objects with which he was connected, it always met with more than ordinary success because of the force of the personality behind it. No one disputed his splendid leadership. He inspired in all who worked for him or with him the feeling that they would receive a just share whether in financial returns or credit for an enterprise: they trusted him. Surely no greater monument exists to the honor of any of our citizens than the Palisades Interstate Park, a wonderful tract of land adjacent to the greatest metropolis of this continent—and its value will increase with the passing years and with the succeeding generations.

[1] The proceedings are given in full in the two-volume official report entitled *The Hudson-Fulton Celebration*, 1909, pp. 392–412. See page 404 as to origin of the bill.

"Army Mental Tests"—A Review[1]

PART RIDDANCE OF CHANCE IN THE CHOICE OF A VOCATION, THROUGH TESTS OF APTITUDE IN CHILDREN, WILL IN THE FUTURE HELP TO ELIMINATE OCCUPATIONAL "MISFITS" AND INDUSTRIAL UNREST

By RICHARD M. ELLIOTT

Associate Professor of Psychology, University of Minnesota

THE remarkable success of mental examination methods introduced by psychologists into the United States Army during the war has naturally become a stepping-stone to further achievement in the technique of mental measurement. With the cessation of hostilities the blanket of secrecy which was enforced under the provisions of the Espionage Act in order to secure absolute control over the production and distribution of test materials was immediately lifted in favor of a policy of widespread publicity. Surplus test blanks and other materials offered for sale by the government were eagerly bought by persons anxious to complete intelligence surveys comparable with the findings of the army examiners.

The Surgeon General of the army further permitted the publication of a handbook, *Army Mental Tests*, editorially supervised by Majors Robert M. Yerkes and Clarence S. Yoakum, which reproduced all the test blanks and printed materials employed in the army examining, with minor exceptions where the material was already available. Exhaustive directions for giving the tests, a brief account of the inception and development of methods, a review of typical results, and some pages on the general significance of the unexpected impetus given intelligence examinations by their military use, complete an indispensable handbook and examiner's guide.

With this book already available, and awaiting the elaborate account of the achievement which it represents to be published in the autumn by the National Academy of Sciences, it may be worth while to consider some of the wider bearings of the large-scale development of differential psychology comprised in the mental test movement.

Scientific assignment of human energies in the furtherance of the aims and interests of an industrial democracy can proceed only step by step with the development of a technique for their scientific appraisal. The immense preponderance of chance factors at present determining the choice of vocation and occupation results in a deplorable percentage of misfits. Here is the soil of an unrecognizedly large portion of that contemporary social disorganization which is at once a taunt to our claim of living in a scientific age and a matter of growing concern to all thoughtful persons eager to forestall and obviate the dangers of industrialism triumphant.

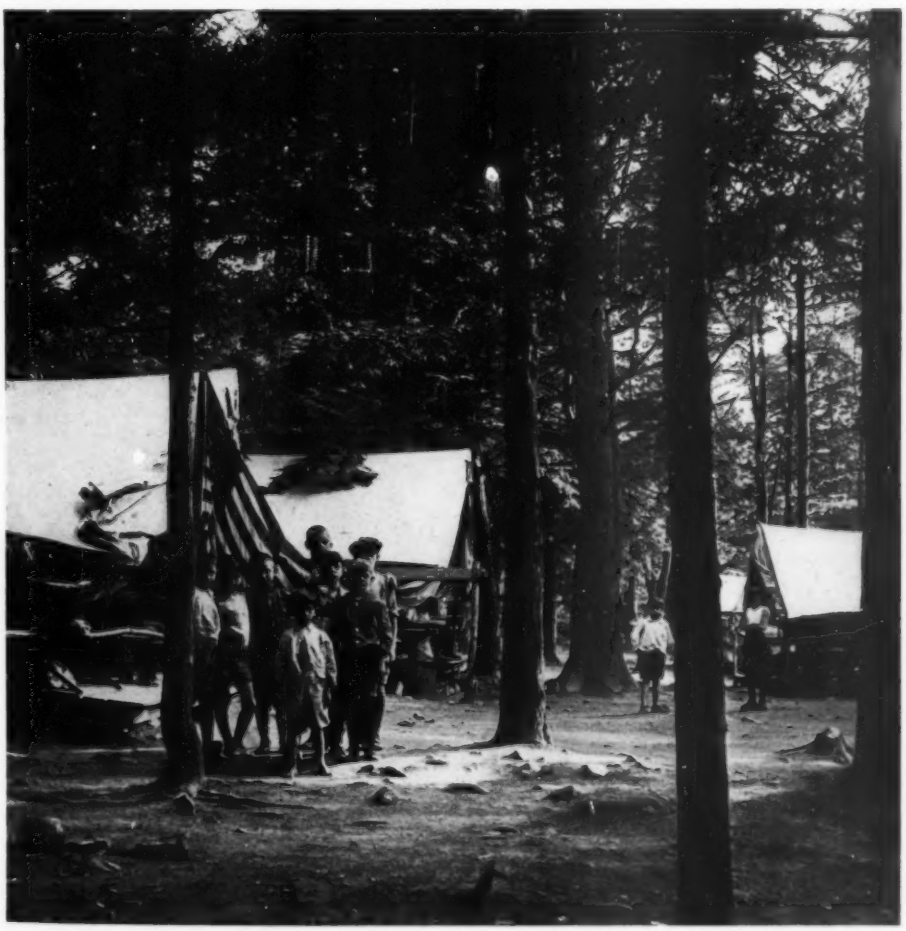
Admittedly the newer technology of "human engineering," as it already functions, for the most part unlabeled, in the fields of business and education, is usually but the servant of arbitrary and traditionally favored procedures and purposes. In the absence of social self-consciousness of the sort that Plato dreamed about, inertia and chance inevitably preponderate in the determination of directions. But only excessive cynicism would refuse to admit that once confidence in methods of sufficient accuracy is justified, wide expansion in the field of their application will follow.

It should lie within the technical power of a well-advanced differential psychology to discover and measure the relative strengths of vocational and occupational aptitudes and proficiencies in young children. Misfits will become predictable, even those arising from temperament. Then slowly we shall outgrow the notion that there is anything

[1] *Army Mental Tests*, compiled and edited by Clarence S. Yoakum and Robert M. Yerkes. Published with the authorization of the War Department. Henry Holt and Company, New York, 1920.

inherent in the idea of democracy necessitating identity of early school training. And with proper differentiation in the training for all those branches of service,—professional, industrial, and artisan,—upon which society depends, we shall make definite progress toward social harmony. This will be achieved as the consequence of individual appropriateness in the placing of men so that their own measure of interest in creative activity of whatever sort is realized, without exploitation, to the full benefit of themselves and of society.

To prognosticate further about the ultimate contribution of differential psychology, so far as it is comprised by the measurement of individual differences in makeup, might conceivably divert attention from its immediate practicality. The work of the corps of mental examiners in the army, however, demonstrated against any reasonable objection the advantage of supplementing personnel work with the data of intelligence examinations, where large unsorted masses of men must be quickly and effectively organized. For many years it will remain the most extensive survey. Appropriately the examinations most largely used were named, for convenience, the Alpha and Beta examinations, symbolic, let us say, of the long line of development which is to follow the pioneering task, for which not even the tools were at hand when first a group of courageous psychologists apprehended the nation's need and proposed a technology for meeting it.



A further scene in the camp life at the Palisades Interstate Park (see page 300)

THE WORK OF A GREAT LANDSCAPE ARCHITECT, AT BUENOS AIRES

Buenos Aires, the largest Spanish-speaking city of the world, was founded in 1541 on the rich pasture land of east central Argentine. Although there are no native forests within many miles, the naturally rich soil and favorable climate have made it possible for a far-seeing government to turn the avenues, squares, and parks of the city into gardens of flowers and trees which bloom throughout the winter. Shady walks and banks of flowers along the water's edge greet the visitor as he approaches from the sea, and spacious boulevards with gardens on either side or down the center conduct him through the city. There are approximately one hundred parks and squares, laid out with forethought and the best skill of the landscape artist. The landscape engineering work has been directed by Señor Carlos Thays who founded the model Botanical Garden where is assembled a large assortment of native and exotic plants arranged not only for beauty but for instruction also

Penguins, in the Buenos Aires Zoölogical Garden, native to the southern part of the continent.—The Zoölogical Garden at Palermo Park has been made in recent years one of the most artistic of its kind in the world, and a most delightful retreat for recreation or instruction. It is unusually rich in its display of South American animal life and possesses a notable collection of llamas, guanacos, and anteaters

Parks and Gardens of Buenos Aires[1]

By F. LAMSON-SCRIBNER

Expert on Exhibits, Department of Agriculture, Washington, D. C. Author of numerous bulletins and articles on botanical and agricultural subjects

THERE probably is no country in the world, not even excepting our own, where civic and rural progress and development have taken place more rapidly during the last twenty years than in the South American republic of Argentina.

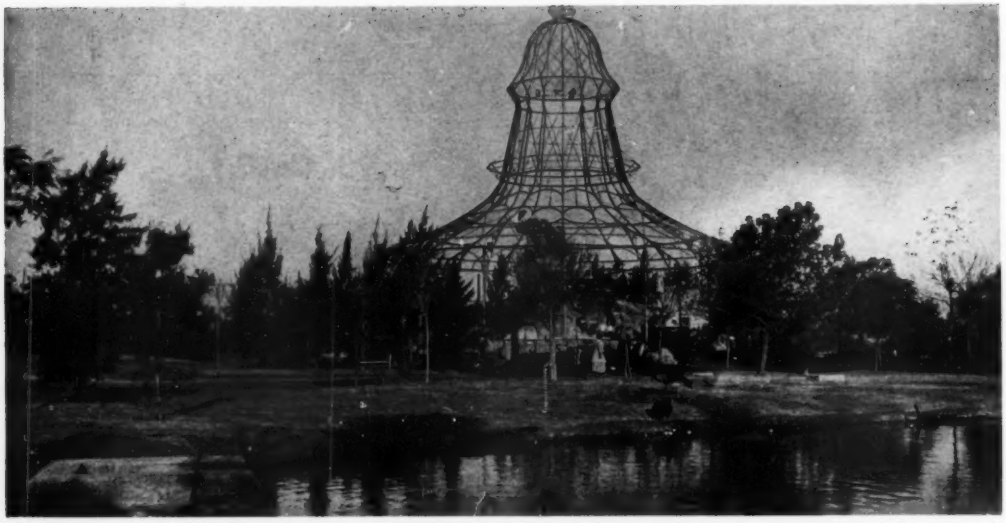
The area of Argentina is as great as all of the United States east of the Mississippi, or six times the area of France. From north to south the range of climate is very great. One may broil in Formosa where conditions are tropical, or freeze in southern Patagonia where the latitude south corresponds very nearly with that of Moscow, Russia, in the north. To this great range in latitude should be added the differences in altitude from the broad plains along the shores of the Atlantic westward to the Cordilleras, some of whose peaks attain the height of 6000 meters or more. The rainfall varies no less than the physical features of the land. There are desert areas, vast treeless plains, and immense forest-covered regions. The flora of the Argentine is exceedingly rich in species and the abundance of its agricultural products places the Republic in the front rank with nations bidding for the world's commerce.

The journey from New York to Buenos Aires, by boat, as we made it, is a twenty-five-day run with brief stops at Bahia, Rio de Janeiro, and Santos, Brazil.

We arrived at our destination on April 30 at the beginning of the winter season, but the climate of Buenos Aires is so mild that flowers bloom in the open parks throughout the winter, and although it may be chilly at times, frosts very rarely occur. Deciduous trees like plane trees and elms shed their leaves, but palms, araucarias, eucalyptus species, magnolias, and the like, afford constant verdure and shade.

The capital of Argentina is one of the busiest cities of the world,—a city of beautiful business streets, broad avenues, palatial residences, magnificent club houses and theaters, delightful parks, and shaded boulevards. Its gardens are of unrivaled beauty and interest. There are approximately one hundred of these parks and squares varying in size from two or three acres to the great Palermo Park which is 2660 acres in extent.

[1] Presented at the meeting of the Botanical Society of Washington, January 5, 1920. Illustrated by one hundred and fifty stereopticon slides from negatives by the Author.



SCENES IN THE ZOÖLOGICAL GARDEN, BUENOS AIRES

It is said that the Zoölogical Garden of Buenos Aires is the finest example of landscape gardening in South America. The aim has been to reproduce as nearly as possible the natural environment of the animals, and also to create throughout the garden beautiful scenes and vistas. Reproductions of ancient temples, artificial grottoes, and rocky caverns, set among shrubs and trees, add to its picturesque scenery. The upper photograph shows the great out-of-door bird house

There are no trees save those introduced and planted by man within many miles of Buenos Aires, no hills and no rocks even, and all that has been done to make the city beautiful and its parks and squares a perpetual delight has been accomplished by a far-seeing civic administration and by well-directed efforts inspired by a keen sense of the beautiful and the pride of intense patriotism.

Nature has furnished here ideal conditions for plant growth—a rich soil, a temperature ranging between 40 and 90 degrees, and ample rainfall of 34 inches. From this point the work has been carried on under the guidance of the celebrated engineer, Carlos Thays, director general of public parks and founder and director of the Botanical Garden of Buenos Aires.

One almost immediately steps from the ship landing at the North Basin into a garden rich in flowers and shrubs and trees interspersed with beautiful monuments and fountains. One of these fountains, at the foot of Calle Cangallo, executed by an Argentine artist, Lola Mora, is particularly handsome. This garden is really Parque Cristobal Colon, Paseo de Julio and Paseo Colon which run into each other. Located along the water front, these walks and plantations of flowers and trees create a most favorable impression upon new arrivals and afford a pleasant resort and resting place to those living near by in a most crowded section of the city. An avenue runs through the middle of Cristobal Colon with gardens on either side laid out in the Renaissance style, the whole being designed on the plan of the Champs Élysées at Paris.

Passing through these gardens on our way to our hotel on Avenida de Mayo we come to Plaza de Mayo or Plaza Victoria. In our country we would doubtless have named this Independence Square. The independence of Argentina was declared here on May 25, 1810, and this Plaza has been the scene of many demonstrations of historical interest during four generations. It is about four acres in extent and is tastefully laid out with walks, flowering plants, and shade trees.

The Government Palace, the "White House" of the Republic—where the President and his Cabinet have their offices—faces the east side of the Plaza de Mayo; from the opposite side one passes into the magnificent Avenida de Mayo which leads straight to the Capitol or Congress Hall, a mile and a half to the west. Avenida de Mayo is one hundred feet wide, with broad pavements bordered with plane trees from Europe. This is the "show" street of the city and contains many fine buildings, including hotels, club houses, publishing houses, restaurants, as well as many large retail establishments.

At the western extremity of Avenida de Mayo is one of the largest and most beautiful squares in the city, upon which the Capitol building fronts, facing east toward the Government House. This plaza contains 17,446 square meters and was laid out in 1910 at a cost of 11,000,000 pesos, gold. It is known as Plaza del Congreso or Congress Square, and is the crowning glory of the efforts of Director Thays in beautifying the city. The hand of the master is clearly manifest in the intelligent selection and artistic grouping of the shrubs and trees, and the pleasing landscape effects that meet the eye.

In the newer parts of the city broad and roomy streets are most common but in the older sections many of the streets are quite narrow with sidewalks hardly wide enough for two persons to walk abreast. Such a street is Calle Florida, the most fashionable shopping thoroughfare, which we will now traverse on our way to the great city park, Palermo.

Calle Florida has been called the Bond Street of the Argentine. It is lined with elegant shops, and here are located a number of costly buildings, including the famous Jockey Club, whose exterior is of the finest architectural design and whose interior is sumptuous in the extreme. The street is only twenty feet wide. Between four and six o'clock in the afternoon all traffic is suspended and the entire street is given over to pedestrians.

Leaving Calle Florida at its northern terminus we enter Plaza San Martin, in the center of which is the fine equestrian statue of the famous liberator, General San Martin. This square is well provided with shrubs and shade trees. There is here quite a pretentious piece of rock work that includes a miniature lake and a rustic bridge. A number of fine buildings surround Plaza San Martin, the most conspicuous being the elegant Plaza Hotel.

IN PALERMO PARK

Among the many parks and shaded boulevards of Buenos Aires the park at Palermo, reached by a three-mile drive from the business center of the city, is the largest and most popular. Palermo Park comprises more than two and one half thousand acres, and contains many beautiful drives, pathways, and artificial lakes; it is kept perennially verdant with palms, araucarias, eucalyptus trees, and magnolias

From this point we will proceed to Palermo Park by way of Calle Alvear, but before leaving the "down town" section of the city, let us pay a very brief visit to Lezama Park and Plaza Lavalle or Liberty Square. Lezama Park is located to the south in one of the most populous parts of the city near the Boca. It has extensive avenues of shade trees, a great variety of shrubs, and a large number of beds of choice flowers. Here are many rare plants of botanical interest. Shady groves and open playgrounds give pleasing variety to the whole design. A small historical museum contains much to interest the visitor.

Plaza Lavalle or Plaza de Libertad, as it is sometimes called, is among the prettiest in the city. It is remarkable for the sunken gardens which enter into its plan of construction. The Palace of Justice and the Municipal Opera House or Teatro Colon, which, it is said, is the most beautiful theater in all America, are on this square.

Leaving Plaza San Martin we continue our journey through Calle Alvear, one of the finest avenues in a residential section lined with palatial homes, and soon arrive at Recoleta or Plaza Intendente Alvear, one of the smaller parks of the city, but filled with interesting plant species and differing from other parks visited in its broken or almost hilly surface. There is a small stream with a miniature cascade running through the grounds, affording an opportunity for the culture of aquatic plants and the building of rustic bridges.

Continuing westward through Avenida Alvear, we soon reach the pride of Buenos

Aires, Palermo Park. We halt at Avenida Sarmiento where the great park of more than two thousand acres opens out on our right. To the left lies the Zoo and, near by, the Fair Grounds of the Rural Society and the Botanical Gardens.

Palermo Park is to Buenos Aires what the Bois de Boulogne is to Paris, Central Park to New York, or Golden Gate Park to San Francisco. It contains many drives and walks, and a number of small lakes. Many different kinds of trees and shrubs have been planted along the drives and about the miniature lakes, and evidently much attention has been given to the development of pleasing landscape effects. The Avenue of Palms is well known to every Buenos Airen, who here on Sundays and holidays comes out for a walk or a drive.

Across Avenida Alvear from Palermo and on the right of Avenida Sarmiento, are the grounds of the Exposition of 1910. The buildings were lightly constructed for temporary service. The main entrance was on Avenida Sarmiento. The great palms about this entrance were transplanted during the period of the Exposition. Local florists made a remarkably fine display of ferns, orchids, and other choice flowers in the Horticultural Palace located inside the grounds.

On the same side of the avenue toward Calle Santa Fe, where it is bordered with tall eucalyptus trees, are the permanent fair grounds of the Argentine Rural Society. These grounds cover an area of about forty-five acres, are very prettily laid out, and are equipped with many substantial and attractive buildings for housing the horses and cattle and general exhibits. The reviewing stand is a permanent structure of steel and concrete, and here are held annually, usually in September or October, agricultural and live-stock shows which would compare favorably with the best held in this or any other country. The native Argentinian is a great lover of horses and the displays of fine horses of all breeds or classes are especially good.

Within the grounds of the Rural Society, at the corner of Plaza Italia and Calle Santa Fe, is located the permanent Agricultural Museum. The building constructed for this museum is of excellent design, well lighted and admirably adapted for the display of the large and varied collections of agricultural products that have been gathered here from all parts of the republic. The object of the museum is to exploit the agricultural resources of the country and afford instruction in matters of agricultural interest. The exhibits, numbering more than 20,000 specimens, are attractively installed and well labeled. They are divided into six classes, namely: (1) Natural Products—woods or timber, soil, etc., (2) Agricultural Products—cereals, oleaginous, medicinal, narcotic, and textile plants, nuts, tubers, fruits, etc., (3) Animal Products—wool, skins, fur, feathers, honey, etc., (4) Agricultural Industries—flour, wine, alcohol, sugar, dried fruits, etc., (5) Agricultural Machinery and Buildings, (6) Agricultural Statistics and Rural Economy. The details of the exhibits are full of interest and the museum as a whole is worthy of the highest consideration. Few if any agricultural museums in the world, certainly none in our own country, are more complete or better designed to meet the purposes for which such a museum is intended. Much space is given to the collections of wheat, both the soft and hard varieties. The labels indicate where and by whom each sample was raised, production per hectare, and the value of the crop.

Maize or Indian corn stands next to wheat in value as an agricultural product of the Argentine. Then follow oats and linseed. Tobacco is already an important crop in some of the provinces, and peanuts now have a place in the agriculture of the country.

The increase in agricultural production during the last twenty-five years has been phenomenal. During this period the acreage under cultivation rose from less than five million to nearly twenty-five million hectares. The average area for the five years 1909–10 to 1913–14 in cereals and flax was 12,683,-085 hectares or more than thirty-one million acres. In 1917–18 there were produced 5,973,000 tons of wheat, 4,335,000 tons of maize, 1,100,000 tons of oats, and 568,000 tons of flaxseed.

In the forestry exhibit in the Agricultural Museum there are more than 750 varieties represented. Each specimen consists of a section of the entire trunk, one and one half meters long. At 80 cm. from the lower end the stem or trunk is cut to the center at right angles to its length, including one half the circumference. Then for 30 cm. there is

WORK OF LANDSCAPE ENGINEERS AT RIO DE JANEIRO

Rio de Janeiro, capital of Brazil, unlike Buenos Aires, is set within a magnificent semitropical forest. The celebrated Botanical Garden is filled with hosts of interesting plants from the warm countries, among which enormous bamboos and stately royal palms are the most striking. The South American municipalities have profited greatly from their employment of landscape engineers as well as botanists and horticulturists in laying out their gardens, thereby producing pleasing nature retreats as well as scientifically valuable collections

a longitudinal section beyond which the terminal portion is cut on an angle or is beveled off. One half of each of these three surfaces is cut smooth or planed, the other half is polished. The appearance of the wood from the rough to the finished condition is thus well shown. The labels accompanying each specimen give the scientific and common names, the botanical family, the habitat, and its economic uses and value. On a small map attached to each specimen is indicated its distribution in the republic. Many valuable hard woods abound in the timbered regions; the number belonging to the Leguminosæ is very large. Quebracho colorado (*Schinopsis Balansæ*) supplies a very hard and exceedingly durable wood, besides yielding an abundance of excellent tannin, and both the wood and tannin are now important articles of commerce.

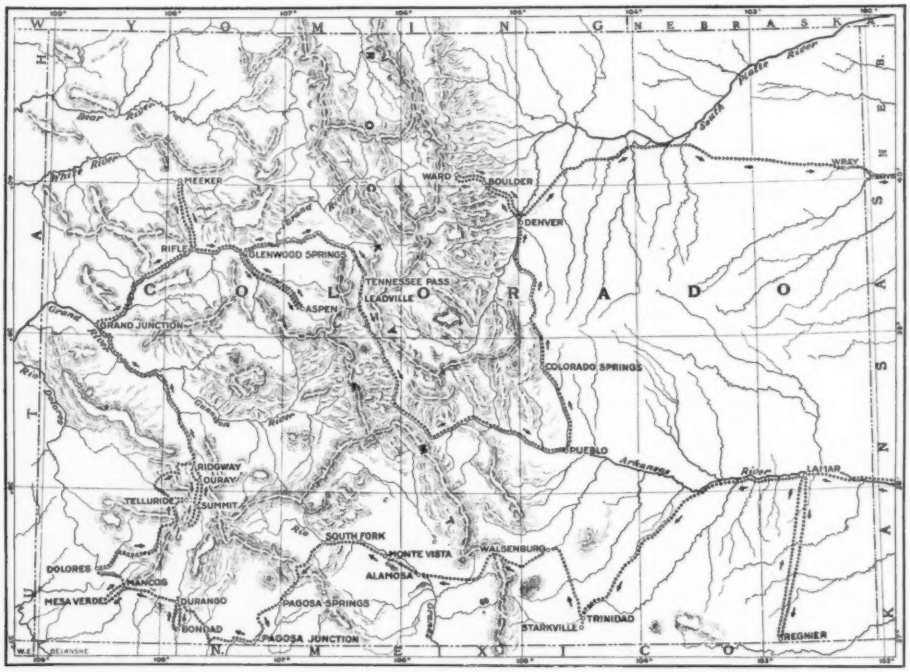
Across the avenue from the grounds of the Rural Society is the Zoölogical Garden which was first inaugurated by General Sarmiento in 1874. Fourteen years later the Garden became the property of the city. Under the direction of Seignior Clemente Onelli it has become the most artistic and beautiful garden of its kind in the world and now figures prominently among the delightful places of Buenos Aires for recreation and instruction. It is open from sunrise until sunset, and the annual attendance ranges from one and one half to two millions. Many kinds of trees and shrubs have been planted in this garden and the effort to develop beautiful scenes and vistas has been very successful. It is now well stocked with animals and birds, and Director Onelli has taken pains to surround the different animals with conditions and housings similar to those of their native countries.

Just beyond, at the corner of Santa Fe and Plaza Italia, is the Botanical Garden. This garden is a model in its way. It was planned and directed by Dr. Thays, and will stand as an everlasting monument to his knowledge as a scientist and skill as a landscape engineer. Begun in 1892, the grounds were opened to the public six years later, or in 1898. The appearance of the garden in 1910 was a revelation in plant growth and bespoke a good soil and adaptable climate and a skillful gardener.

Within its twenty-two acres have been assembled plants from all the countries of the world. Some of these are merely curious, like Palo Borracho (*Chorisia insignia*) and Ombu (*Phytolacca dioica*) and some are only decorative, but for the most part the plants and trees one sees here have an economic value or scientific interest. There are groups of medicinal plants, oleaginous species, and fiber plants; there are narcotic plants, and those valued for their perfume, and so on through all the uses of the vegetable kingdom. There are bits here and there that have been laid out as special gardens—a Roman garden of Pliny's time and a lovely miniature French garden are conspicuous examples. There are sections devoted to the typical plants of Argentina, of Europe and Asia, of Africa, North America, and Australia. Among those from Australia are eighty or more species of eucalyptus or gum trees. There are collections of palms and bamboos, of cacti, coniferous plants and grasses, and so on, amounting altogether to more than 3500 species. One stands amazed at the number and variety of plant families installed in so small an area without any evidence of overcrowding or lack of harmony in arrangement.

There are more than forty markets and market places in Buenos Aires. The great central produce market on the Riachuelo is an enormous three-story building covering several blocks. It is devoted chiefly to wool and hides and, it is said, is the largest market in the world. There are many meat and fruit markets and the hucksters and corner fruit stands are as common here as in the cities of the United States.

The roads beyond the city are usually very poor and country produce is still brought to market on great two-wheeled carts drawn by oxen. The people of Buenos Aires are excessively fond of flowers for home decoration and many flower markets have opened up in recent years. So great has this trade become that Buenos Aires has been called the City of Flowers



The expedition's route through Colorado.—Colorado may be divided into three main north and south belts, each covering approximately a third of the state. These are the High Plains on the east, the Rocky Mountain system traversing the middle, and the Colorado Plateau—a rough region of plateaus, desert valleys, and mesas—on the west. Starting from either side and traveling toward the central mountains one traverses successively the Upper Sonoran, Transition, Canadian, and Hudsonian life zones to the Arctic-alpine zone on the highest ranges. Between the higher ranges and extending as a central belt lie a series of high, open plateaus from twenty to fifty miles wide known as North, Middle, South, and San Luis "parks." The first three are occupied chiefly by Transition and Canadian zones and the last by Upper Sonoran and Transition. The northern and southern sections of the state differ slightly in plant and animal association, although not in general zonation. By traveling parallel eastern and western routes lengthwise of the state, Dr. F. E. Lutz, in charge of the American Museum Expedition, visited representative areas of all major associations and topographic regions

An Entomologist in Colorado

From hot deserts, through forests, to the wild flowers and the snows of mountain tops.—Field study with special reference to the life zones of the state

By FRANK E. LUTZ

Associate Curator of Invertebrate Zoölogy, American Museum of Natural History

"WHERE does the West begin?" Thinking of the people, we might sincerely answer with the poem that was pinned on the wall of my hotel room in a little Colorado mountain town, and say that it was where the heart grows warmer and the hand clasp grows firmer. But where does the West begin in unemotional scientific discussion?

Years ago, when the West was young—nearly fifty years ago, in fact,—the Government, at Washington, published an elaborate geographical, geological, and biological survey of the territories west of the 100th meridian. Nature, too, seems to have accepted this meridian of round numbers as a convenient boundary line, for she has used it roughly as the limit of abundant rains on the plains. We, then, may say that we have really reached the West when we have crossed into Montana, Wyoming, Colorado, or New Mexico. Much short of that is East, except to those of us who learned to look at the sun setting back of the Appalachians as the veritable close of day.

How little do we know of the West, our

West! Much fun has recently been poked at the tourists who, cut off from spending their summers seeing the things that generations have looked at in Europe, have discovered Alps in their own country and architectural monuments of prehistoric Americans—some of the houses possibly made when Rome was in her infancy. But entomologists at least may not throw rocks of ridicule at tourists. We do well to search out the secrets of Central Africa and the wilds of South America, but, when we at the American Museum came to write an account of the geographic distribution of the insects of the West Indies, we found it necessary first to learn more of the insects of our own country, particularly of our West. Accordingly, two years ago, we sent an expedition to Arizona to study the fauna of mountains which are isolated by deserts just as the West Indies are mountains isolated by water. Last year we had an expedition to get samples of the fauna from here and there on the plains and the mountains of Colorado.[1]

Anyone who has traveled or even read good descriptions of regions other than his own, realizes that the plants and animals of one region may differ considerably from those of another. If the difference is great and is not merely the effect of environment (such as the differences between a swamp and a dry hill) the two regions are spoken of as belonging to different life zones, the term "zone" being a relic of the time when it was thought sufficient to speak of the animals of the Torrid Zone, Temperate zones, and Frigid zones. Florida is clearly not in the same "life zone" as New York, and the New York region is different from Labrador. Not so clearly, perhaps, but truly, the low-lying region of Long Island has a different set of animals and plants from that on the heights of the Adirondacks in the same state.

It is also to be noted that the high altitudes in one locality tend to have the same set of animals and plants as do the lower altitudes of more northern localities. Life zones are defined everywhere in accordance with variations in temperature and the distribution of the fauna may be further influenced by humidity. The life zones at the north and high on mountains are known as Boreal. In these there is, in general, sufficient humidity to support such life as the low temperatures permit, so that humidity is not so important as temperature. Below the Boreal is the so-called Transition zone, and the zones farther south or at still lower altitudes are called Austral. (See diagrammatic arrangement below[2].) In the Austral areas there is a great difference in humidity east and west of the 100th meridian. The rainfall west of this line is slight compared with evaporation; east of it the rainfall is abundant, so that the plants and animals of the same altitudes and temperatures east and west may differ more than those of different altitudes and temperatures either east or west; or, using the names which have been given to these subdivisions of the Austral areas, the Austroriparian, for example, differs more from the Lower Sonoran than the Lower Sonoran differs from the Upper Sonoran.

It was near Dodge City, Kansas, that we crossed the mystical 100th meridian and passed from the humid or Carolinian division of the eastern Austral to the dry Upper Sonoran division of the western Austral. Naturally the change in climate, plants, and animals is not abrupt, but even occasional glances out of the car window showed that we were getting into a different country. Near Dodge City the prairie becomes sandier and more humpy. The humps tend to be flat-topped, somewhat mesa-like, and a sort of yucca is a common wayside plant in places.

[1] We expect to follow this up by obtaining similar samples from other regions in which we hope to find not so much insects new to science (that is easy), but insects that will throw light on the relationships of one faunal region to another and how these relationships came about. In other words, we are engaged in a new survey of the territories west of the 100th meridian. A brief sketch of the trip to Colorado is given here as an illustration of this work, work in which we are admittedly getting merely small, scattered samples of the fauna, for the insects of June are widely different from those of September, and those obtained by one collector are far from the same as those obtained by another equally good collector who may, by reason of special interests, have even unconsciously adopted different collecting methods. Furthermore, as only those who have been on the ground can fully realize, the West is vast.

[2]

		Arid West of 100th meridian	*Humid East of 100th meridian*
Boreal	Arctic-alpine Hudsonian Canadian		
Transition		Transition	Alleghanian
Austral		Upper Sonoran	Carolinian
		Lower Sonoran	Austroriparian Gulf Strip

We reached Lamar on the third of June. It was cold and rainy and some of the inhabitants even asserted that it had snowed the day before. This southeastern corner of Colorado is the lowest part of the state but, while enthusiasm outruns fact when it maintains that Colorado begins where Mt. Washington (6290 feet) leaves off, Lamar has an altitude of 3600 feet.

It was too cold, rainy, and windy just then to do much insect collecting, but I picked up a few specimens among the cottonwoods that bordered the Arkansas River and left the next morning in an automobile stage for Springfield, the seat of Baca County. It took us more than five hours to cover the fifty miles of prairie between Lamar and Springfield. The vegetation, except along the few streams, is of the short-grass type, the kind that makes you wonder how so many cattle manage to thrive on it. For miles around, a conspicuous landmark is the relatively high Two Buttes (400 feet above the plains) and they were especially interesting that morning because they were surrounded by what seemed to be a beautiful lake, but which was really a mirage.

At Springfield I was lucky in catching a ride to Regnier in an antiquated but efficient Maxwell that was used by the mail carrier. I delivered mail to the boxes on my side of the road while prairie dogs sat bolt upright at their burrows, scolding, and the curious little owls that live in deserted "dog" burrows blinked at us. Ground squirrels, jack rabbits, and cottontails were also in evidence. "Bull bats"—a night hawk that flies like a bat and makes a noise like a bull—were sleeping on the tops of fence posts; blue quail scurried about, while bobolinks, meadow larks, and lark buntings made merry. At about supper time we arrived at Regnier, which is really the ranch of Dr. Felix Regnier, the post-office being in his kitchen.

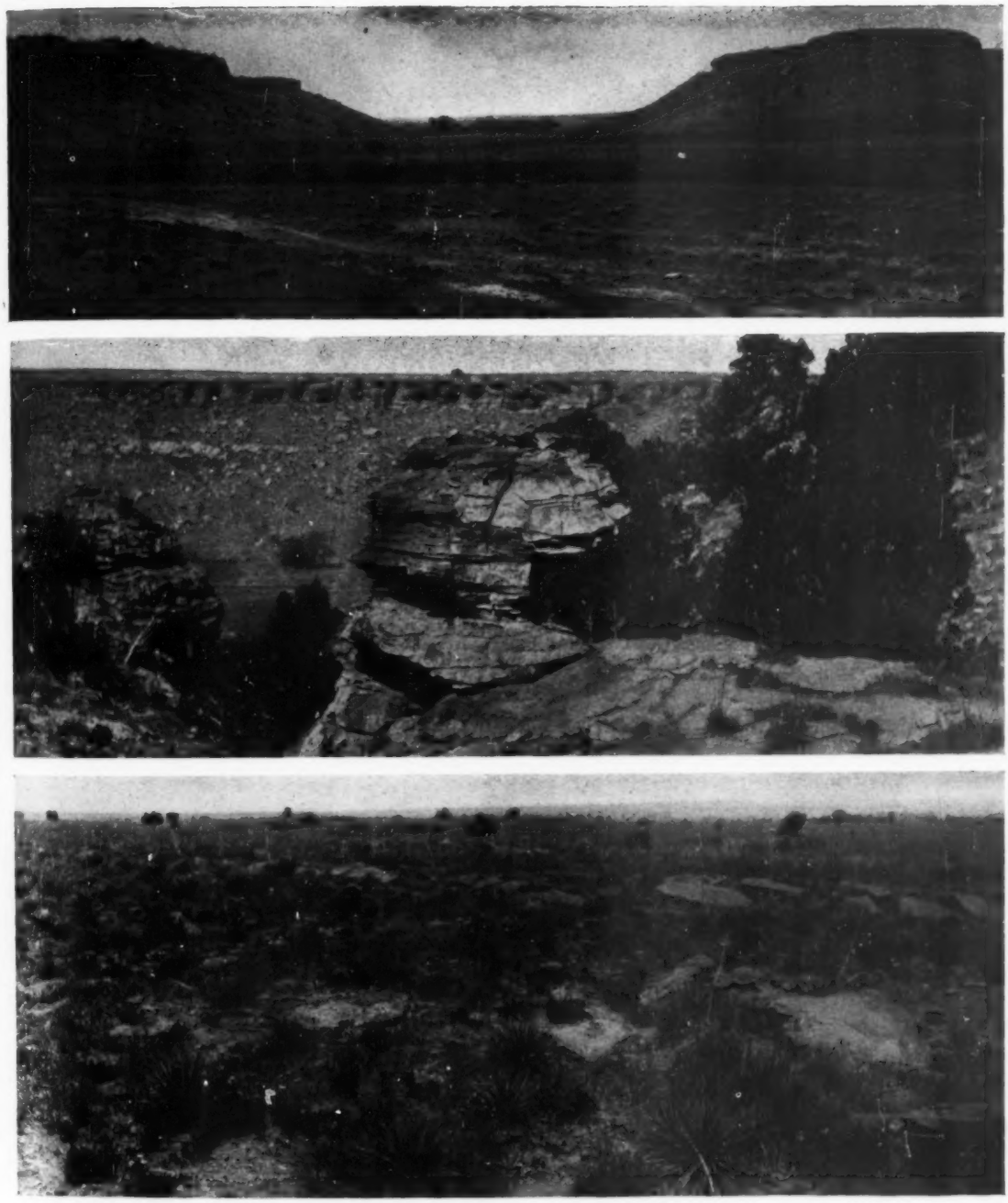
One of the things in addition to Dr. Regnier's kind hospitality that attracted me to this region is the fact that the prairie is here cut up into numerous mesas and cañons, offering a wide range of local environments.[1] There are dry, level flats with low sparse vegetation, but gay with herbaceous flowers; there are cottonwoods and other luxuriant growths along the streams; the bowlder-strewn slopes of the mesas are covered with cacti; the "rim-rock" of the mesas is cedar-fringed; and most interesting of all, are the yuccas, cacti, and other drought-resisting vegetation of the rocky roofs of the mesas. In the cañon to the east I found a wide expanse of glistening sand teeming with predaceous wasps and tiger beetles, digging bees, and other interesting creatures, while in the cañon to the west was a veritable marsh.

After returning to Lamar I made short stops at Trinidad, Walsenburg, Alamosa, Monte Vista, and, on June 17, reached the village of South Fork. This is situated in an elbow of the Continental Divide at the junction of two tumbling mountain streams that give rise to the Rio Grande del Norte, the stream that eventually flows so sluggishly across the desert on the Mexican boundary. The elevation here is about 8200 feet, and the Canadian zone presses strongly on the thin tongue of Transition that extends up the river valley. The Transition is "said to be the foothill zone of Colorado, with its lower limit marked by the edge of the plains on the east and by the approach to desert conditions along the western bases of the mountains and plateaus."[2] The Canadian zone "occupies the middle slopes on the main ranges and extensive areas in the mountain parks and caps all of the higher western plateaus, thus including the larger part of the coniferous forests of the state. Broadly speaking, the Canadian zone is characterized in the mountains of Colorado by extensive forest belts of aspens (*Populus tremuloides*), lodgepole pines (*Pinus murrayana*), and the lower, heavier part of the Engelmann spruce belt."

At South Fork I secured the kind help of Mr. Million, forest ranger (formerly known as "Sourdough John," and a one-time acquaintance of Jesse James). We packed our camp and collecting outfit in his Dodge and started over the Continental Divide for Pagosa Springs. The first night we camped in the valley of the South Fork of the Rio Grande at about 8500 feet altitude. The chief trees on the hillsides were aspen, Douglas spruce, and Rocky Mountain yellow pine. In the valley were willow, narrow-leaf cottonwood, and blue spruce. The

[1] The Lamar-Regnier region is a part of the Great Plains Division of the Upper Sonoran zone.

[2] *North American Fauna*, No. 33. By Merritt Cary. United States Department of Agriculture, Washington, 1911.



UPPER SONORAN LIFE ZONE IN COLORADO

Climatic areas of somewhat similar temperature and rainfall harbor similar associations of plants and animals and so constitute more or less well-marked "life zones." Colorado, on account of its diversified topography and range of altitude, possesses a greatly varied flora and fauna, representing five out of the total of seven life zones found in North America. These three pictures, taken near Regnier in the southeastern corner of Colorado, illustrate the characteristic appearance of the so-called Upper Sonoran zone which includes all the basal plain on both sides of the Colorado mountain ranges or nearly one half the total area of the state. From the plains rise the rocky slopes of the mesa (photograph at top), with its juniper-fringed "rim-rock" (middle photograph), and flat desert roof bearing yuccas and cacti (lowest photograph). The Upper Sonoran is an arid zone, extending between the Great Plains on the east and the Great Basin of Utah and Nevada on the west. Associated with its drought-resisting vegetation are such small mammals as spermophiles, prairie dogs, and several species of mice and rats, and a varied desert reptile fauna. Junipers (*Juniperus monosperma* and *J. scopulorum*) are characteristic, and piñons also grow along the foothills and on the rough country of the south

OTHER VIEWS IN THE COLORADO UPPER SONORAN

The western slopes of the Colorado Ro kies differ from the high plains of the east in a more arid climate and more deeply erodcd surface. Sagcbrush (top and bottom photographs from Mesa Verde and Bondad, respectively), sheltering cottontails and jack rabbits, is the characteristic growth of this region, although along the streams are found cottonwoods and willows. The Upper Sonoran zone, in spite of this aridity, is the agricultural land of Colorado and wherever it can be irrigated, it supports valuable grain, beet, potato, and fruit crops. Over the uncultivated arcas range great herds of cattle, feeding on the sparse grass. The Mesa Verde photograph shows typical wild-flower gardens of the Upper Sonoran, and the middle photograph from Wray (northcastern Colorado) a type of sand-hill country like that of Nebraska to the north

THE BEGINNING OF THE FOREST—TRANSITION ZONE

The Transition zone on the foothills covers an area equal to only about one fourth of the state. The Transition country is for the most part too rough and broken for agriculture. The intimate relation between crop zones and natural life zones is marked in Colorado so that a biological survey is prerequisite to intelligent agricultural projects. The upper scene, at Pagosa Springs (southwestern Colorado), shows the meeting of Upper Sonoran with the Transition above it; the bottom photograph is from Electric Lake, north of Durango, where the Transition shades into the Canadian still higher; the middle picture illustrates pure Transition near Walsenburg, among the eastern foothills, with cacti, junipers, piñons, and yellow pine

valley floor was rather wide and more or less boggy, bright with great masses of blue iris and yellow *Thermopsis montana*.

We may use trees as illustrations of the conditions at this extremely interesting location, partly because their distribution has been very thoroughly worked out and partly because they are familiar to most of us. The thousand or more species of insects living there have not yet been identified so that we do not know what their evidence will be, but it is clear that this evidence must be carefully collected and just as carefully used, for the creatures of the slope on which we were camped have distributional ranges quite different from those on the valley floor or those on the opposite slope. Furthermore, all about there was a tension, the Transition and the Canadian each straining for an increase of its respective area.

We next went to a camp at the point where Pass Creek joins the South Fork of the Rio Grande at an elevation of 9425 feet. It was fairly distinct Canadian zone with aspen, balsam fir (*Abies lasiocarpa*), blue spruce (*Picea parryana*), and mountain juniper (*Juniperus sipcrica*). Rocky slopes, narrow ravines, and extensive open "parks" scored with elk hoofs offered a variety of habitats for our collecting. Although past the middle of June, the nights were cold and the ground was covered with frost in the mornings. Our evening fire was the meeting place of the forest rangers who were working in the vicinity. Many tales of the mountains were told. The rangers were of the opinion that the "yellow" black bears are getting more plentiful, that beaver are increasing, that sheep are driving out the elk.

The road up Pass Creek over the Continental Divide and down Wolf Creek had been cleared of snow and was, for the most part, dry. In many places there is space enough between straight up and straight down for only one vehicle.

The roof of the continent is here 10,800 feet high. I chased butterflies over snowbanks and "Sourdough" amused himself picking flowers with one hand while at the same time he made snowballs with the other. The pools of melted snow were musical with frogs. Flies, more abundant than bees, were pollinating the hundreds of white and yellow flowers. We were here at the upper edge of Hudsonian, and Arctic-alpine was in sight on the mountain crests around the pass.

Our next camp was near the foot of the mountains on the Pacific slope for the water of Wolf Creek eventually reaches the Bay of California. Extremes in camping met there that night. On one side of us was a retired business man and his family with an expensive car and two auto tents; on the other was an old-timer who was on his way in a prairie schooner to work in Kansas harvest fields. During the night an Indian came thundering into the camp, not on a pony and with a whoop, but in a noisy Overland. The next day we reached Pagosa Springs, where I was sorry to part company with Mr. Million and his stories of wild Colorado from the time of Leadville, Cripple Creek, and Creede to the present.

At Pagosa I collected in Transition by going north and in Upper Sonoran by going south. Although differences in latitude, when great enough, determine distributional areas, the factor here was a difference in altitude which merely happened to coincide with north and south. The same was true at the next stop, Durango, and south of it, at Bondad, the conditions were quite similar to those over large areas of the Upper Sonoran in New Mexico, sagebrush plains with scrub oaks, juniper, and piñon on the slopes.

Through the kindness of Messrs. French and Clay I spent nearly a week at a lake north of Durango where I collected through an altitude range of from about 8000 to about 10,500 feet, Transition to Hudsonian. It occurred to me after I had left that I had not wet a line although the guest of a fishing club nor had I touched an artificial "fly"—the natural flies were so interesting.

At Mesa Verde I was joined by Mr. Pearce Bailey, Jr., a volunteer assistant. Mesa Verde is developed and protected as a national park under the Department of the Interior because of the cliff-dwellers' ruins, but fortunately this protection extends to the plants and animals. Before going there I had met the superintendent who regretted that I had no apparatus for taking color-photographs of his "flower gardens." When I had seen them my regret was as keen as his; luscious blue lupines, silvery Mariposa lilies (*Calochortus*), beardtongues (*Pentstemon coloradoensis* and *comarrheus*), mallows (*Sphæralcea coccinea*) and sunflowers (*Helianthus petiolaris*) set in the gray

Between Transition and Canadian zones.—The Canadian life zone, such as is typical of central and southern Canada, covers the middle altitudes of the Colorado mountain ranges. Where this photograph was taken near the South Fork of the Rio Grande in the San Juan Mountains, the Canadian and the Transition zones contended for supremacy, aspens, yellow pines, and spruces mingling on the mountain-sides

AS WE CLIMB THE COLORADO MOUNTAINS

Higher in Typical Canadian.—The forests of the Canadian zone are chiefly occupied by aspens and Engelmann spruces, the latter extending down from the next higher or Hudsonian zone. The aspens grow together in dense thickets, their light green foliage standing out clearly among the dark conifers. This picture illustrates typical Canadian growth near Telluride, west of the Continental Divide

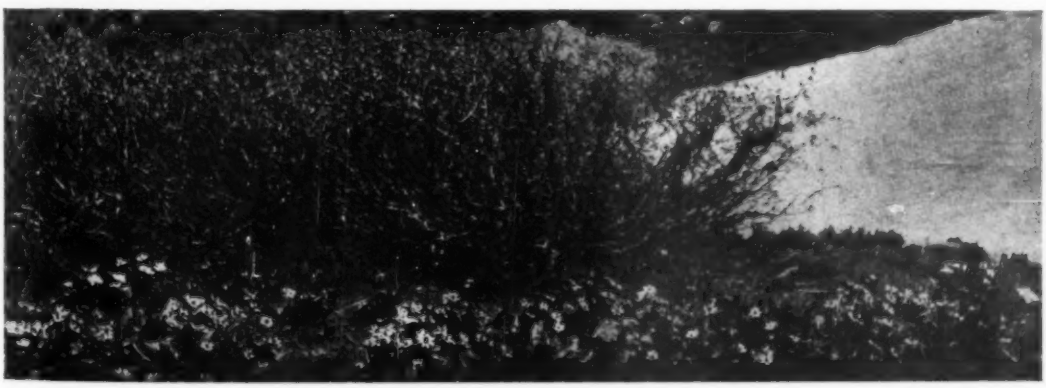
Still Higher in Upper Canadian.—Most of the Canadian zone in Colorado is forest covered. The aspen is associated in the northern two thirds of the state with lodgepole pine (shown here) and in the south with white fir. Wild elderberries, blueberries, and currants flourish, and the columbine, the state flower, blooms abundantly. Canada lynx, western fox, and black bear range into the adjoining zones on either side

WE CLIMB STILL HIGHER

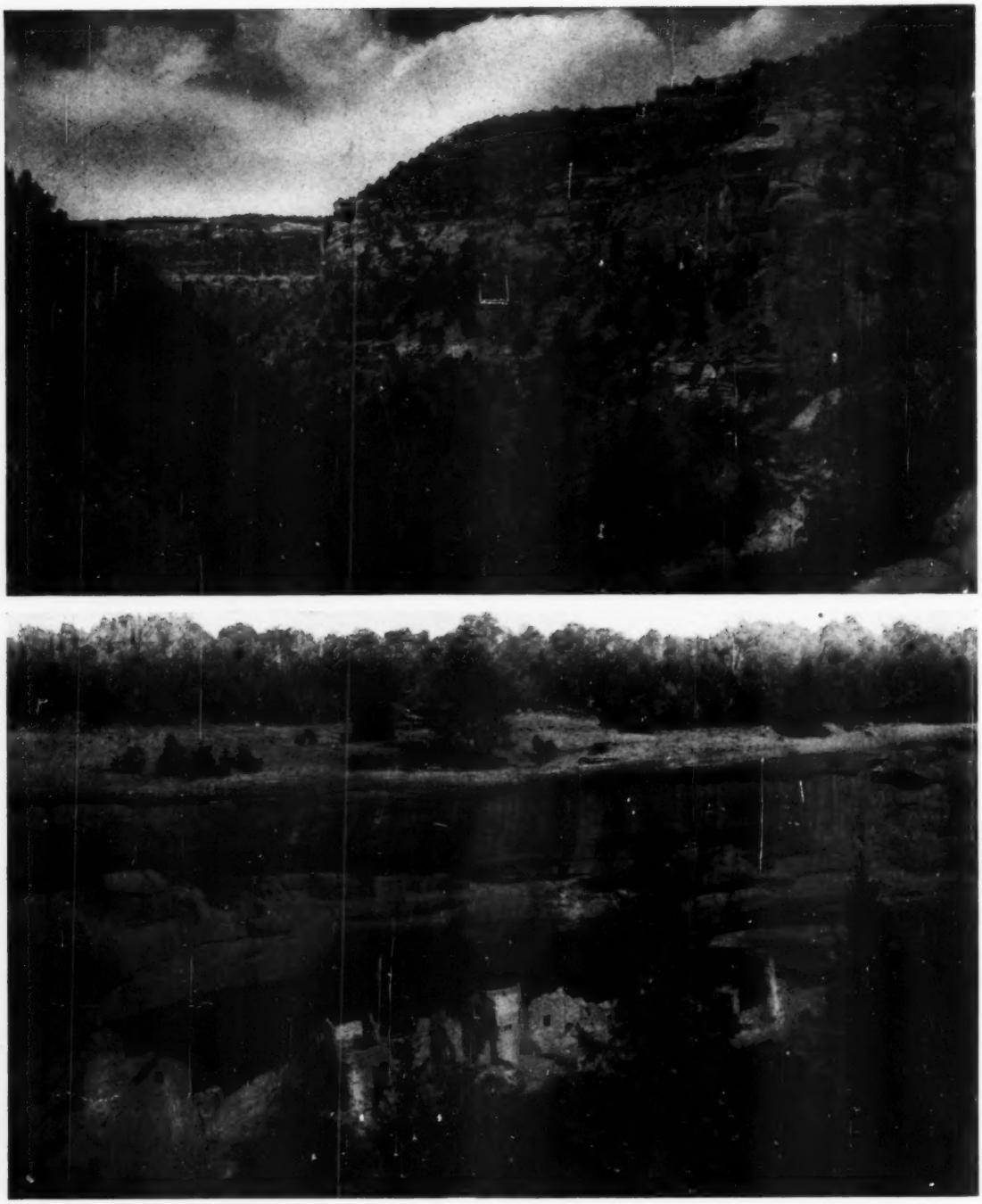
From the forested Canadian zone into the Hudsonian to timber line

The Hudsonian zone as represented in Colorado is relatively narrow—about 1000 feet in vertical width. The upper two photographs were taken along Pass Creek in the Sangre de Cristo Mountains. The bottom comes from a higher altitude still, about 10,800 feet, near Wolf Creek Pass on the Continental Divide. A dark belt of Engelmann spruces and balsam firs winds in and out, marking with its clear-cut edge the limit of tree growth. The expedition collected butterflies over snowbanks, and the pools of melted snow were musical with frogs

Very bare and bleak at the top.—The bleak wastes of the Arctic-alpine zone extend upward from about 11,000 feet elevation. Snow lies on the ground for the greater part or all of the year, but wherever it melts or blows away during the summer, many brilliant flowers enliven alpine meadows. These flowers are near relatives or actual representatives of species growing along the shores of the Arctic Ocean. Grizzly bears, mountain sheep, coyotes, western foxes, martens, porcupines, and snowshoe rabbits find their way here, and the white-tailed ptarmigan, pipits, and brown-capped rosy finches breed nowhere else. The photographs were taken near Ouray, Colorado



The dwarfed willow is the only tree of the Arctic-alpine zone. It abounds chiefly in bogs and gulches, and even after many summers stands only a few inches high



AT MESA VERDE NATIONAL PARK

The Spruce Tree Cliff Ruins (lower photograph) are one of a remarkable series of about 300 prehistoric cliff dwellings at Mesa Verde. This house, possibly made when Rome was in her infancy, contains 114 rooms and 8 ceremonial chambers, and must have sheltered between 300 and 400 inhabitants. The vanished race of unknown antiquity which inhabited these high fortresses found fertile fields among the rough Upper Sonoran valleys as have their white successors at the present time.

Mesa Verde National Park, in Montezuma County, southwestern Colorado, is typical of the juniper and piñon belt of the Upper Sonoran life zone, with a scattering of Douglas spruce coming down from the Transition

sage with a background of dark green cedars, and piñons. Insect collecting was fine, and man at Mesa Verde was as satisfactory as nature. Visitors are provided with clean, comfortable, board-floor tents; excellent meals are served; and the broad veranda of the museum of cliff-dweller culture affords a fine view of cañons and mesas. The region is Upper Sonoran with a touch of Transition.

In this first month I had obtained samples of the fauna of southern Colorado from Kansas to Utah. Now we turned north. Leaving Mancos in the hot Upper Sonoran about noon we lunched at Dolores. Along here the railway tracks were banked with wild roses in full bloom. Wild geraniums, large red lilies, Indian paintbrush, and many plants I did not know, were a riot of color. By the time we reached Stoner Creek spruces were fairly common. After we got well into the spruces the roses dropped out. Above Rico the cañon narrows very much. Then we pulled out of it and by four o'clock our train was passing through high Alpine meadows with snow on the hills all about us. At Trout Lake the peaks seemed to be right at hand—snow and bare rocks, so bare that one of our train mates said, "It looks like they had just been made." Then we started down and it seemed almost as though we were sliding down a spiral stairway, the road was so crooked and the descent so rapid. We dropped 1700 feet to Vance Junction and then our engine went to the other end of the train and pulled us up 640 feet to Telluride.

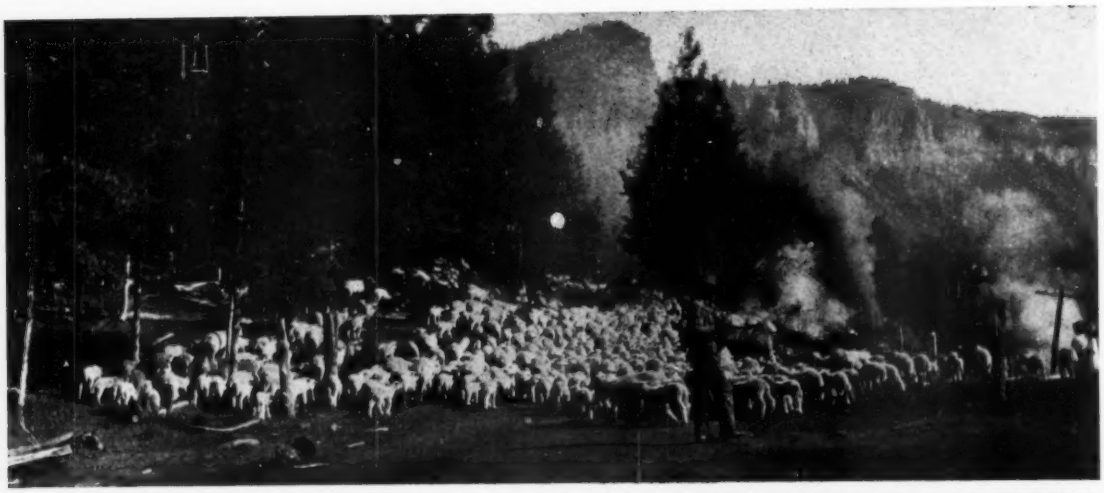
Telluride has an extremely beautiful view up the main street, with a waterfall tumbling off the mountain like a huge city fountain. That evening I tried to buy a post card of this but found nothing but pictures of mines, smelters, and business blocks. The town is nearly 9000 feet above sea level. Wild roses and blue foxgloves were in full bloom at the starting of the trail. At about 9800 feet we were among aspens and spruces. I kept on slowly, collecting along the way, until 11,750 feet altitude was reached. Here I was right among —and on—snow banks of the Arctic-alpine. Between the masses of snow were masses of flowers similar to those at the head of the Rio Grande. Willows at the edge of the snow had catkins but no leaves; ten feet away the same species was in leaf and the catkins fully seeded. After washing down a belated luncheon with snow-water, I walked back on the trail, getting many specimens along the way and keeping an eye on the barometer in order to have the altitude notes as accurate as possible.

The sharp contrasts to be found in Colorado are shown by the fact that the next morning we were collecting Upper Sonoran things at Ridgway in sagebrush, cactus (with red and also yellow flowers), pink foxglove, yellow asters—also heat and horseflies. The last two were torturing, but the flowers were swarming with entomological specimens and the hot sand was fairly alive with tiger beetles and digging wasps and bees. That evening we were wearing sweaters in Ouray, where we were joined by another volunteer assistant, Mr. Herbert F. Schwarz. Here we worked for several days, chiefly in the Canadian but getting well up into the Arctic-alpine also.

On one of these days we accompanied Mr. Watkins, forest ranger for Ouray, on one of his regular trips. We first took Horsethief Trail straight up the side of one of the cliffs that hem the town in—straight, that is, in the same way that a sailboat goes straight when sailing into the wind. My horse was a "trail-edger," a trait that avoids the danger of bruising one's legs against the rocks on one side and adds to the realization that it is a long way to the bottom on the other side.

Finally we got to what seemed to be the top of things. We were above timber line on a grassy ridge filled with a great variety of Arctic-alpine flowers. Thinking that the trail would be easy from there, I asked Mr. Watkins to lead my horse behind his while I walked, collecting along the way. I soon changed my mind, for, around a corner, was more up grade and above 10,000 feet a low-altitude lung does not pump enough air to permit of fast walking up hill.

I then accustomed my horse to the net and collected from horseback pretty much as though I were playing polo. I soon stopped this for we began to go along the tops of ridges where the flowers were too close to the ground to be easily reached. Then the weather changed and it began to rain and blow. Rain (almost hail) and wind, combined with altitudes ranging from 10,000 to 13,000 feet, make it bitterly cold in the latitude of Colorado. It occurred to



IN THE COLORADO ROCKIES

On their way to pasture above timber line

Old charcoal ovens at Tennessee Pass—enemies of the forest which have been vanquished by conservation

The expedition, of the summer of 1919, representing the department of entomology of the American Museum, collecting on the Continental Divide, at 10,800 feet elevation

me to describe Colorado as "sagebrush and sunshine, spruce and showers," only we were above the spruces and I did not call what we were having a "shower."

Two days later at Grand Junction we were in the Upper Sonoran life zone again, this time the extension from the Utah deserts, where it was as hot as it had been cold on the American Flats. From there we went to Rifle and then to Meeker where so many big-game parties outfit. The Upper Sonoran at the latter place is a southern extension of that in Wyoming. We found insect, or "little-game," hunting in this northwestern corner of Colorado as good as the "big-game" sort is said to be and I venture to say that we got more trophies.

Glenwood Springs was our next stop, chiefly for the sake of getting a sample of the Canadian and Hudsonian zones on the western side of the Continental Divide at Aspen to compare with the same zones on the Divide at Tennessee Pass and on the eastern side at Leadville. I wish space permitted to tell of the almost neglected beauties, grand and in miniature, of the Aspen country; of the genial Mr. Maupin and his equally genial partner at Tennessee Pass where they divert water from the Pacific slope to pan gold and then sell the used water to farmers far down on the Atlantic slope; of the splendid lodgepole pine forests there, and our experiences camping in a forest ranger's cabin; of Leadville itself with sagebrush that is not Sonoran; and of the mountains near Leadville, including Massive and Elbert, the highest east of the Pacific states. But I must hurry from Leadville in the story, as we did in the journey, through Colorado Springs and Denver, with its most successful museum of natural history, to Boulder.

Here we had the pleasure of associating with Prof. T. D. A. Cockerell, of the University of Colorado, probably the most active student of natural history in the United States, a man who, to mention only one phase of his work, has described more than three thousand new species or varieties, not only of insects but of plants, mollusks, and other forms of life. Boulder itself has one of the best locations for the study of distribution that I have ever seen. Toward the east the plains extend until they are lost to sight by the earth's curvature; on the west the mountains rise like a wall to heights only a little less than Elbert and Massive, and most of that mountain land is assured to posterity because it is held either by the Department of Agriculture as national forests or by the Department of the Interior as the Rocky Mountain National Park. Professor Cockerell took me to White Rock in the Upper Sonoran plains where there is an island of even more southern flora and fauna; in the mountains we went to the Hudsonian about Long Lake near Ward and could easily have reached the Arctic-alpine if we had wished.

Our next and last collecting place was at Wray on the eastern border of the state. Here we were almost due north of our starting place, Regnier, and in the same broad belt of Upper Sonoran. The country was of the Nebraska sand-hill and prairie type. Contrasts were sharp between the very arid, wind-blown sands, the semiarid prairie and the rich bottoms of the narrow gulches. For a part of the time here I had the good fortune to stay at the Boyes ranch, the house set in the cottonwoods of Dry Willow Creek (which is never dry) protected from the drying winds of summer and the fierce blasts of winter by the gulch's sides. Some of my best captures were made here and certainly the comparison of the fauna of the ravine with that of the prairie will not be the least interesting that will be made.

Comparing the insects of this region in the northeastern corner of Colorado with those of Regnier in the same "zone" but in the southeastern corner will not be so easy, since the collecting in one place was done in late August and in the other in early June. But doubtless a way will be found and we have also the material from the Sonoran in the southwestern corner at Mesa Verde and the northwestern at Meeker, both separated from these by the Continental Divide. We have also material from many places in the Transition, Canadian, Hudsonian, and Arctic-alpine. There are more than 23,000 specimens, probably representing at least 2000 different species, or nearly half as many species of insects as there are of mammals in the whole world, and yet, when one realizes the large size and the still greater complexity of Colorado, together with its insect fauna of at least 15,000 species, one must confess that our expedition collected only samples.

The People Always at Attention

So long as private capital is on the continual search for private privilege by which it may grow faster than under normal conditions, and so long as the lawmakers of our country are more or less dependent for their legislative election on local votes from this private capital and its friends, just so long will it surely follow that all the rest of the country at any given moment must be in arms to protect public rights. All the millions of us might as well gird on the armor for constant vigilance.

We can but wonder who is responsible for the final form of the Water Power Bill, which includes the national parks. In itself the bill is good and has been before Congress for a decade. The water power on public lands such as the national forest reserves no doubt should be made available for local capital under certain necessary restrictions. But nothing should be allowed to interfere with the historic national parks and monuments. They have been set aside by Congress with the express purpose of keeping them in an unchanged state of nature for the American people. They are the people's museums of the original American wilderness. The various falls, river basins, and lakes are among their greatest assets, and no way could be found to destroy them more effectively than to encroach upon these waterways. Congress could not have realized that passage of the Water Power Bill meant abandonment of its own creations which it has cared for during nearly half a century.

The bill creates a commission of three persons, the secretaries of War, Interior, and Agriculture, respectively, with power to "grant licenses for the *construction of dams, power houses, and other necessary or convenient structures on public lands and reservations.*" It was thrown into conference six months ago and a compromise bill came before Congress just a few days prior to its recent adjournment; this was passed hurriedly and sent to the President, who signed it.

The unhappy inclusion of the national parks in the final form was not brought to the attention of the members of the National Parks Association until the day of adjournment. As they say, the "situation is unthinkable." Each citizen in the United States who is interested in the conservation of the scenic grandeur of which we are so proud, and in the rights of the American people, has a plain duty before him: to suggest to the representatives of the law in Washington from his state that the first work of the new session of Congress should be to amend the Water Power Bill.

We shall be the more willing and ready to act if we realize that such cases are continually to be expected, that it is just our simple duty, plain before us, to keep a grip on affairs so that all such matters which slip through Congress a part or all of the way toward becoming laws may be counteracted. The opinion of every voter is bound to have influence. The more forcefully he expresses his opinion the more effect it will have.

Let us at once send for the recent *News Bulletins* of the National Parks Association (No. 1512 H Street, N. W., Washington, D. C.) and get acquainted with the facts in detail. Also let us write to the same address for the first number of *The Nation's Parks*, a magazine just inaugurated to meet the crisis at hand. It is frankly admitted that the time is one of peril and our help is asked.

Surely we will not see dams and power houses, under the Water Power Bill, constructed in connection with Yosemite or Yellowstone falls. We will not allow a bill to pass Congress which will authorize use of Falls River Basin in Yellowstone Park for irrigation purposes! Such a bill comes up again before the December Legislature. We will not allow Montana ranchmen to dam the beautiful Yellowstone Lake in Yellowstone National Park.

All national reservations, both the so-called "national parks" and "national forests," should serve for the recreation of the people. The relatively very small "national parks" are for recreation only, each having some notable scenic feature which justifies its withdrawal from industrial development. The very extensive "national forests," which serve for recreation, safeguarding the timber, and equalizing the water flow, should also be open to local use of their water power and other resources, under permit and with scientific supervision.

The Congressmen are confused between these two policies. They know what the western commercial and industrial interests want; they are not so sure what the people want. Let us tell them what we want. Let us stand behind public rights.

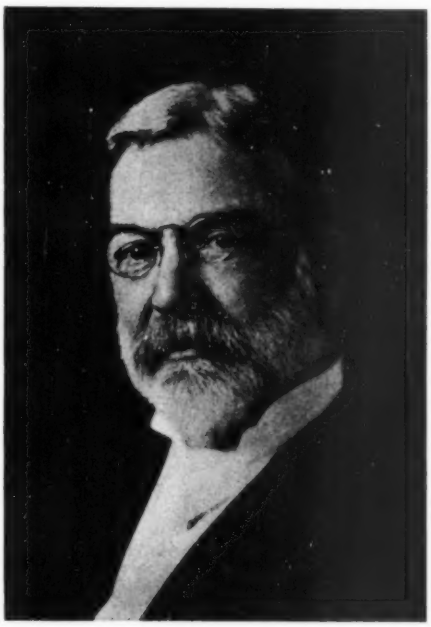
William Dutcher—In Memoriam

A leading pioneer in the cause of wild life protection in America

By T. GILBERT PEARSON

Secretary, National Association of Audubon Societies, New York City

AT his home in Chevy Chase, Maryland, William Dutcher, president of the National Association of Audubon Societies, died on July 1, 1920, in the seventy-fifth year of his age. Those who knew him only in connection with his work for bird protection will experience the realization of profound loss that always comes when a great leader has fallen. To those who were intimately associated with him during the active years of his life, the passing of an unusually inspiring and kindly indulgent friend will be of life-long sorrow and regret.



Mr. William Dutcher, 1846–1920, president of the National Association of Audubon Societies for the Protection of Wild Birds and Animals since its incorporation in 1905

William Dutcher will go down in history as one of the leading pioneers in the cause of wild life protection in America, and as the man who, more than any other, was responsible for the establishment of the National Association of Audubon Societies for the Protection of Wild Birds and Animals. Dutcher did not originate the Audubon Society. This was done by George Bird Grinnell, in 1886. Neither did he originate the Committee on Bird Protection of the American Ornithologists' Union. This was started at the suggestion of William Brewster, in 1884. These two influences dealing with the lives and fortunes of wild birds, the one emphasizing the scientific and technical, the other the popular and sentimental, were drawn together by the force of Dutcher's personality and in the end were combined into the National Association, of which by unanimous acclaim he has from the beginning been president.

In his younger days Dutcher's tastes led him into activities the experiences of which were destined to form a basis from which his later work was carried on with such rare intelligence and wide perspective. For many years he was an enthusiastic sportsman and made at least two trips annually to Long Island for the purpose of shooting ducks, geese, and shore birds. It is recorded that on one occasion, while in a blind with a bayman, he shot a bird that even the experienced local hunter could not name for him. He brought it home, secured a work on ornithology, and upon investigation found that he had taken a specimen of the Wilson's plover. This led him to ascertain the correct names of other birds that he shot. His nature was such that when his attention was once drawn to a subject that appealed to him, his interest became intense. It was, therefore, but natural that when once he began to study birds he was soon a most ardent student of ornithology.

He stopped shooting for sport and began to collect specimens. During the years that followed he wrote and published many papers on the birds of Long Island. His private collection of about two thousand birdskins he later donated to the American Museum of Natural History.

When along in the eighties the killing of herons, gulls, and other birds for their feathers had reached its height in this country, Dutcher was much stirred by the articles published by Dr. Grinnell and the information on the plumage traffic brought to light by the Bird Protection Committee of the American Ornithologists' Union. Dutcher, although not chairman of this committee at first, was very much interested in its work, and when in 1900 Abbott H. Thayer, the portrait painter, collected and placed in his hands $1400 for the protection of sea birds along the North Atlantic Coast, it may be said that William Dutcher's specific work for bird protection had begun. He visited the coast of Maine, located various breeding colonies of gulls, terns, and other water birds, and secured wardens to protect them during the nesting season.

In April, 1902, while chairman of this committee, he was also made chairman of the National Committee of Audubon Societies, which that year came into permanent organization. In January, 1905, at the suggestion of Albert Wilcox, of New York City, there was incorporated from this National Committee, the National Association of Audubon Societies. For the six years that followed, Dutcher was the Association's president and chief inspiration. He was tireless in inaugurating and pushing campaigns to secure state adoption of the "A. O. U. Model Law," later more generally known as the "Audubon Law," for the protection of nongame birds. He came to abhor millinery traffic in feathers of wild birds with all the might of his intense nature, and by pen and voice he sent his ringing protests through the length and breadth of the land. Under his powerful and convincing teachings thoughtful people in every section of the country were attracted and drawn to the cause of bird protection.

William Dutcher was a man of handsome physique and with a personality that drew men to him in a most unusual manner. There are many engaged in conservation work today who will recall that their first incentive to enlist in this cause came as the result of a talk with, or a letter from, this enthusiastic leader of bird protection.

On October 19, 1910, while at his home in Plainfield, New Jersey, he was stricken with paralysis, which rendered him entirely incapable of speech. For nearly ten years he lived in this most helpless and distressing condition. During most of this time his mind appeared to be clear, and he took the greatest interest in all the Association's developing activities, and would show the keenest delight when word reached him of any triumph for the cause of bird protection.

He is survived by his wife and their only son, Colonel Basil Dutcher, of the United States Medical Corps.

On July 6, 1920, he was laid to rest in Hillside Cemetery, Plainfield, New Jersey. It was a beautiful summer afternoon, and some of those who were present noted that during the last moments of the service about the grave, a robin in a grove near by sang with great power and clearness. Its cheerful notes were truly characteristic of William Dutcher's attitude during his long period of helplessness, and seemed also to speak of the joys of the future life toward which, with unwavering faith, his eyes had ever turned.

Photograph by Alvin R. Cahn

The Silver-winged Sea Birds

Observations on habits made while photographing the breeding birds of the Louisiana Gulf Coast [1]

By ALFRED M. BAILEY

With the Biological Survey of Alaska; formerly a member of the scientific staff of the Louisiana State Museum

IN days gone by the first coming of the hosts of terns and sea gulls from their southern winter homes to their breeding grounds along the Gulf and Atlantic coasts was eagerly awaited, and the news was heralded far and wide. Boat after boat, with its load of gunners, headed for the favorite feeding places, and the birds were greeted with such a murderous onslaught that several species of these graceful creatures were virtually exterminated. Times have changed since then and wise methods of conservation prevail. Our national government is now supervising its natural resources, and, with state coöperation, there is little to fear as to the outcome; but state coöperation is a necessity.

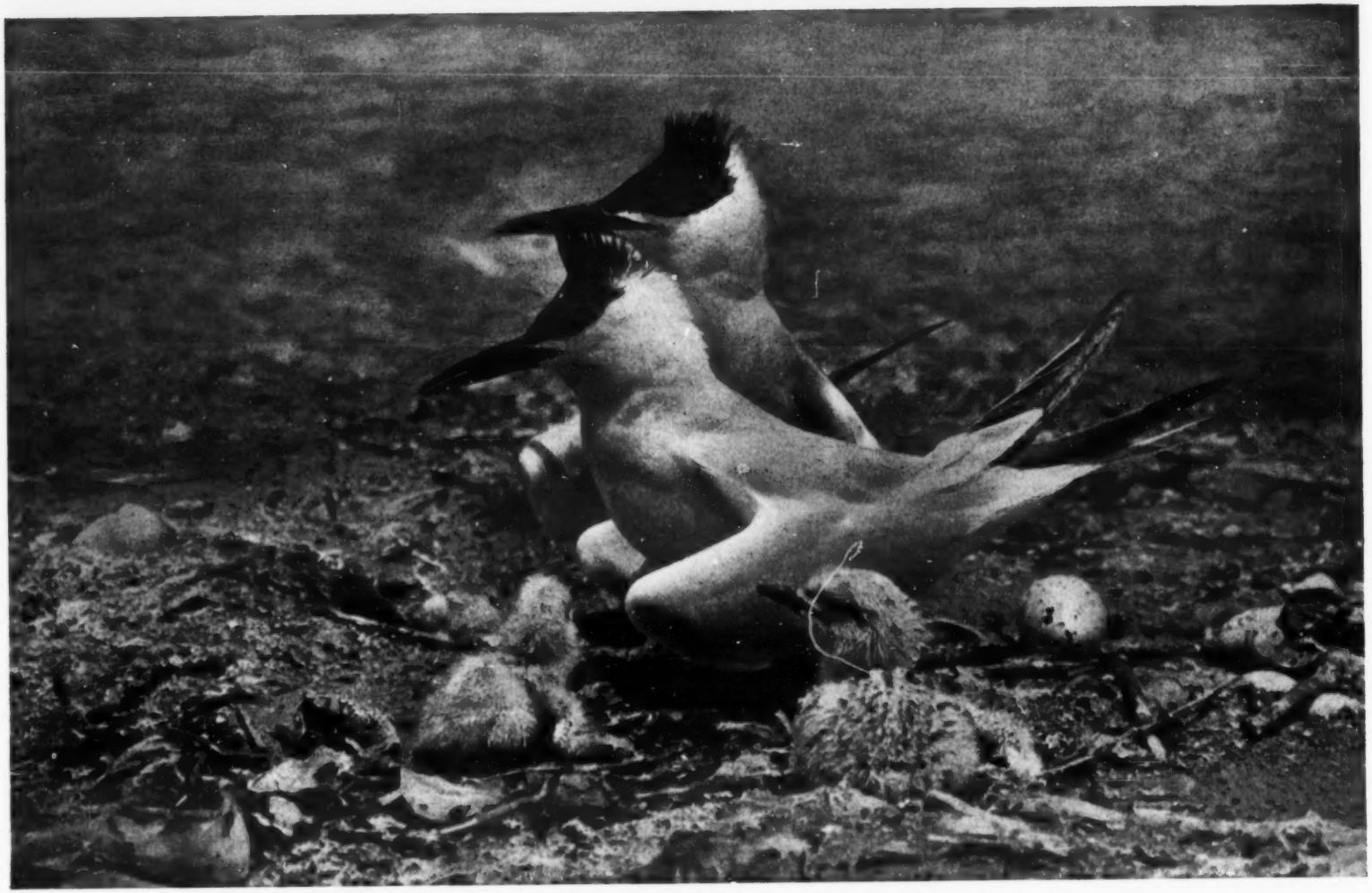
Along the Louisiana coast are some of the greatest bird colonies of today, rarely disturbed by poachers and regularly patrolled by state wardens. Thousands of terns and gulls breed along the marshes and off-lying shell keys, while the flash of a multitude of wings against the blue of sky and water is a familiar sight. The greatest colonies of nesting sea birds are to be found from the mouth of the Mississippi River eastward to the border of the state of Mississippi. Five species of terns and the laughing gull are commonly found.

The royal and Cabot terns are the most fearless of all, and the most numerous. They nest together in great flocks, each species keeping more or less apart, but individuals of each are usually found in the colony of the other. The courtship antics are similar in the two species. The birds pair off and soar together, one bird closely following the other in every movement. They sail without apparent wing movement, and so closely do they swing together and keep their interval, that the flight seems mechanical. The eggs of all the terns breeding on the shell keys are deposited directly upon the ground. The royal and Cabot have one egg each, while the least and Caspian terns usually have two. So protectively colored are the eggs of most sea birds that great care must be taken by the observer when walking among them.

The birds when disturbed exhibit great concern, and clouds of them float overhead, calling out their displeasure. It is when the little downy babies first make their appearance, however, that the adults become most fearless. They will then allow an intruder to come to within a few feet of the nest before

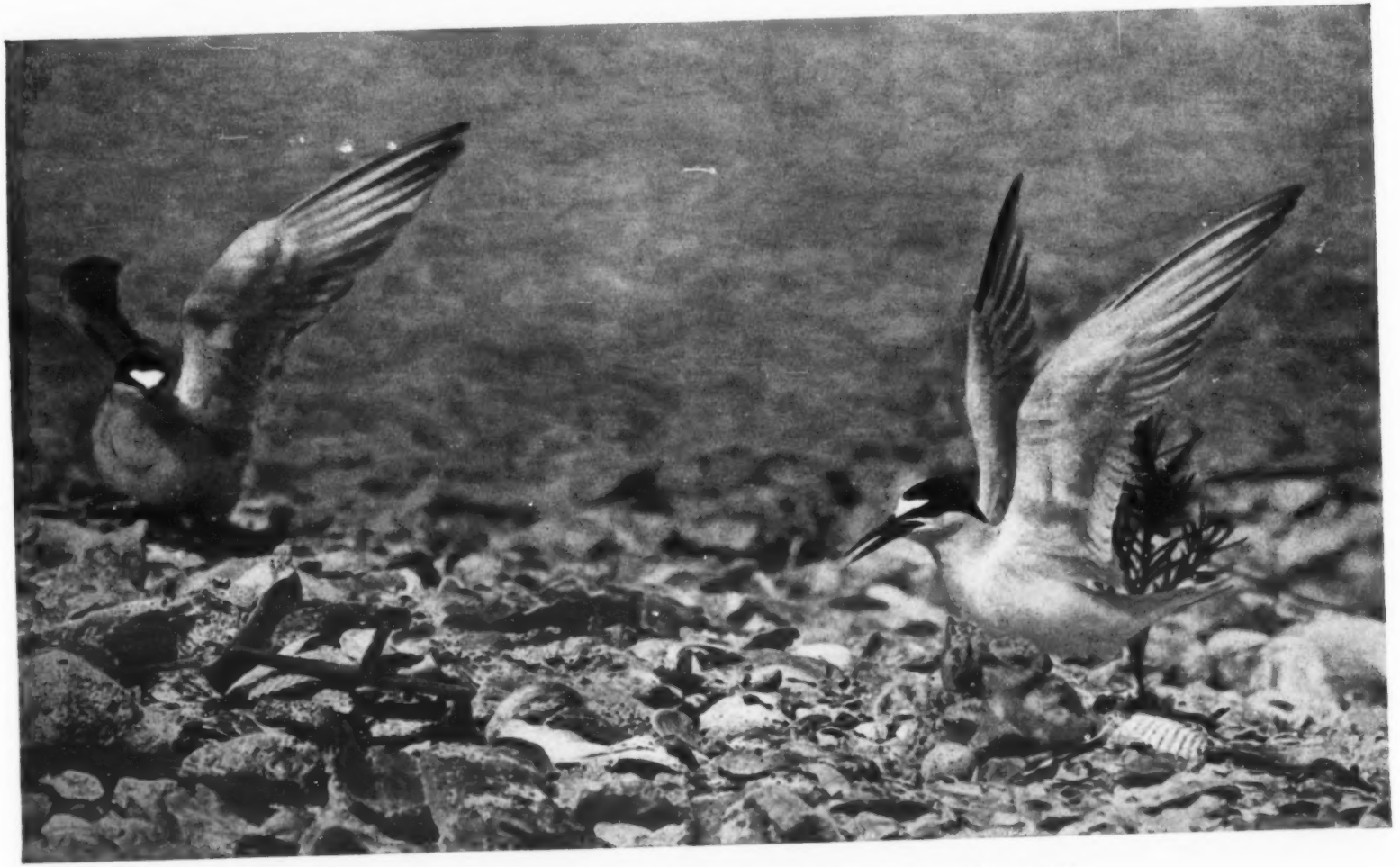
[1] For additional data and pictures of the water birds of Louisiana, see NATURAL HISTORY, Vol. XIX, No. 1, 1919, and Vol. XX, No. 2, 1920.

Illustrations from photographs by the Author.



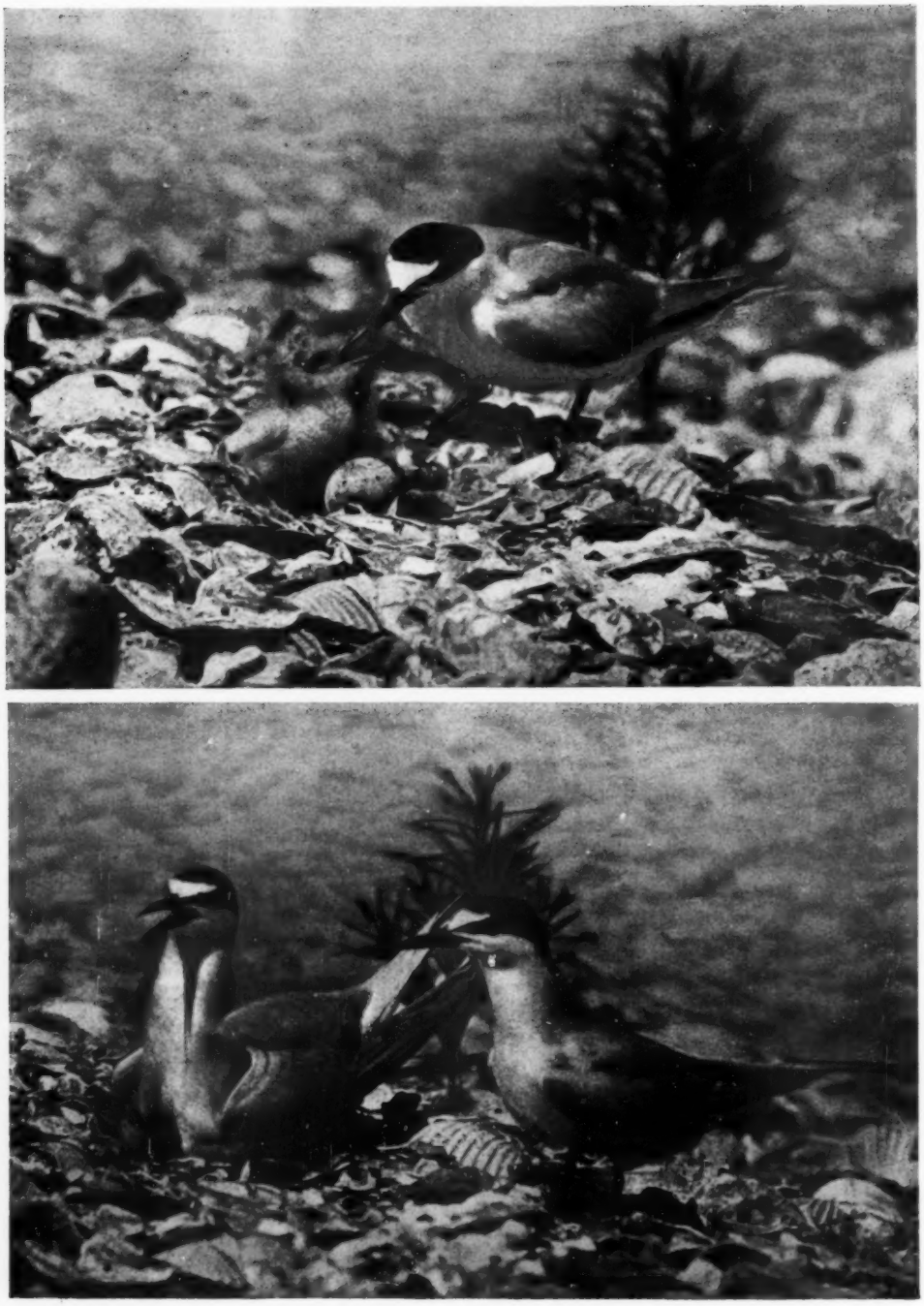
CABOT TERNS—PROTECTED RESIDENTS OF LOUISIANA'S SHELL KEYS

Large colonies of nesting sea birds are to be found on the salt marshes and shell keys along the Louisiana coast where nation and state give them protection from poachers. Of the five species of terns the Cabots (*Sterna sandvicensis acuflavida*) are the most numerous and fearless, nesting on the sunlit shell as remote as possible from human habitation



SO FAR AS KNOWN, THE FIRST PUBLISHED PORTRAITS OF LEAST TERNS

The least terns (*Sterna antillarum*), the smallest of our silver-winged sea birds, are now recuperating their numbers after barely escaping extermination. One colony studied on Freemason Keys, Louisiana, in the summer of 1919, included about one hundred adults with many fluffy youngsters. The latter crouched close to the shell and lay still at our approach instead of skimming away as do the young of some of the other species. Their parents, however, are the wildest of the terns and quickly desert the young at the approach of a human intruder. When alighting the least terns run some distance over the ground with wings gracefully extended



DOMESTIC INSTINCTS OF THE LEAST TERNS

So quickly does a tern mother rush the food into the young bird's gaping mouth that we were unable to get any photographs of the proceeding except in the case of the least terns. The favorite fare consists of the small fish and shrimps which abound in shore waters. In fishing, the terns hover in the air for a moment and then suddenly dart headlong on their prey, sometimes completely disappearing from view beneath the surface.

Their eggs are laid in a slight hollow in the shell on the ground and for a large part of the time are left to the warmth of the sun. Of the terns on the Louisiana coast, four species, the Cabot, royal, least, and Caspian, all except Forster's, nest in colonies on the shell keys

they desert. The intense heat kills the chicks if they are not protected by the parent's outstretched wings, and it is quite usual to see the panting babies resting in the shade thus made. When they are approached, the masses of young birds scurry away like drifting sand, always attended by their screaming parents hovering overhead.

Small fish and shrimps are the main items of food, which are secured by diving. The adult birds dart from on high with the speed of an arrow, sometimes disappearing completely from sight, and rarely do they miss their aim. When feeding the young, the mother has an irritating way of standing off and teasing the baby, then suddenly rushing up and chucking the food into the gaping mouth. So quickly was this done that I could scarcely get a photograph. Indeed, I saw many chicks secure their midday meal, but I could not register the performance except with the least terns.

These little fellows, the smallest of our terns, were nearly exterminated along our coast, but are now regaining their lost foothold. I found a colony of about one hundred on Freemason Keys this last June, and ten fluffy babies were crouched here and there in the shade of wisps of salt grass. The adults of the least terns were more wild than those of other species and deserted the young while we were yet one hundred yards away, but they continually circled overhead, while the babies, as if profiting from previous experience, crouched close to the shell and refused to move even when in danger of being stepped on. We erected a blind, and within a few minutes the adults lost their fear and settled down to the waiting chicks. Not until then did we appreciate the numbers of little ones scattered around the colony. The ten babies we first noted multiplied to several times as many, and with old birds only ten feet away from us, we had ample opportunity to study them. When brooding, the parent birds fluff out nearly double their ordinary size, with wings hanging and tail above the primaries, and when alighting, they run over the shell with wings extended in the most graceful manner imaginable.

Paddling along the bank of some sheltered bay, one is continually flushing small flocks of a dozen or so Forster's terns from their secluded homes. They follow the boat a short way, then return to their domestic duties. They, too, are easy to study at their nests from a blind, although the couple of feet of muck and water about the nest do not offer all facilities for study.

The Caspian terns are rather rare along the coast, although we found several small colonies. The easternmost mud lump had a colony of about thirty pairs and each pair had two fresh eggs at the time of our visit. I am convinced that they are poor home makers, for they deposited their eggs close to the water's edge, directly upon the mud where they were soon incased in slime and some of them half buried. The birds wildly deserted their nests at our approach, and although I left my blind there overnight, they refused to pose for photographs. Young Caspians take to the water more readily than any of the other species. They have a plaintive call note which carries a great distance. The first time I heard this note I was mystified, and it took me more than an hour finally to determine its source—a young Caspian far out from land. The parent bird hovered overhead and guided the young back to shore as soon as danger seemed past. The Caspians do not appear willing to fight for their rights, for several turnstones were busily breaking tern eggs while the owners stood on a little bar near and watched with apparent indifference.

The beautiful laughing gulls are audacious birds, following closely after the boats to gather in scraps. They do not nest in colonies but pick out sheltered places under a mangrove bush or among the marsh grasses in which to build. They nest abundantly on all the mangrove islands, several thousands crowding on Battledore, but I never found nests within ten feet of one another. When the birds approach the nest, they have the habit of alighting far behind, and skulking through the grass until within sight of it, then standing motionless behind some obstruction, sometimes for half an hour. Mosquitoes seem to be particularly attentive to the photographer during this time, and as the slightest movement causes the gull to spring into the air, he can only take the punishment in silence.

Louisiana has her thousands of birds in many different colonies, and each colony is increasing and forming others. With continued protection, we may hope for that former abundance of avian life so characteristic of our coasts in the early days.

The Dead Eagles of Alaska Now Number 8356

IN January, 1919, through the columns of *Bird-Lore*, the National Association of Audubon Societies first advised the public of the nefarious bounty law in Alaska, which provides for the payment of fifty cents for every American eagle killed in that territory, and in the May-June issue of the same year it gave an account of our letter to the Governor of Alaska urging the repeal of this law at the last session of the Alaska Legislature.

In turn others have voiced their opposition to the idea that Alaska should seek to exterminate these noble birds. The association has put in motion certain activities which we have reason to believe will, *before long*, result in the repeal of this law. In the meantime the slaughter of eagles goes on at the rate of two hundred a month.

The following letter, dated April 22, 1920, from the secretary of the Alaska Fish and Game Club, brings up somewhere near to date the available information regarding the slaughter of these birds:

My dear Mr. Pearson,

Complying with the request as stated in your letter of April 13, it is advised that the Territorial records show that since last reporting to you as of date December 6, 1918, bounty has been paid upon 3256 eagles or total of 8356 since the passage of the act and its taking effect.

A vast difference is noted in the numbers of this bird showing in southeastern and western Alaska and it is safe prediction that if the slaughter continues for a few years longer the species will become practically extinct in this country. The number upon which bounty has been paid does not cover all which have been destroyed, for it is agreed between hunters that many a bird which has been shot is not recovered. Various estimates have been made as to the proportion of those brought in for bounty to those destroyed ranging from 25 to 50 per cent. It is believed that out of every four shot, three are reported for bounty, the other is either lost in the woods or seriously wounded and subsequently dies.

It will be a pleasure to respond to any of your inquiries from time to time, so do not hesitate to command.

(Signed) C. D. GARFIELD,
Secretary, Alaska Fish and Game Club.

The National Association of Audubon Societies is collecting resolutions on this subject from various organizations to file with the Legislature of Alaska. All interested clubs and associations are invited to coöperate by sending such resolutions to No. 1974 Broadway, New York City.—T. GILBERT PEARSON, Secretary, National Association of Audubon Societies.

A Bibliography of Fishes

THE AMERICAN MUSEUM has already published two volumes of the *Bibliography of Fishes*—one in 1916 and one in 1917—which give an inquirer in this field a list of about 50,000 titles of books, reports, and pamphlets, dealing with a vast and complicated literature extending from the time of Linnæus down to the year 1914. Such a work was necessary, since it had become difficult and vastly time-consuming to learn what had already been done as a first step in increasing our knowledge. In point of fact, earlier lists of references were so faulty that he who wished to study any phase of fishes was often obliged to devote weeks, even months, of his time to "running down" references. Someone had, therefore, to attack the problem of gathering this vast literature in an accessible form and presenting it worthily to future workers. It may be said that the present volumes have been on the way for thirty years, and that for nearly a decade the American Museum of Natural History has had its shoulder to the wheel in completing this altruistic work. The first two volumes gave the names of authors and the lists of their writings: there remained to produce an index which would render the titles accessible, and it is this index volume which at present is nearly ready to put in the hands of the printer. It represents three years' work on the part of the editors, Prof. E. W. Gudger and Mr. Arthur Henn, with the coöperation of the writer, out of whose card index of references the present work has grown. The third volume will include index, titles of pre-Linnæan publications, lists of voyages and expeditions which concern fishes, anonymous publications, and the like. We may note that in the opinion of the expert bibliographer of the New York Public Library, the present work (which refers not only to fishes from the viewpoint of living and fossil forms, but to their anatomy, physiology, histology, embryology, parasites, messmates and diseases) will be the most complete bibliography of any large scientific subject, and that it will rank in completeness with the concordances of Shakespeare and of the Bible. It is to be recorded that during the preparation of the index volume, the Museum lost through death the services of the well-known ichthyologist, Dr. C. R. Eastman.—BASHFORD DEAN, Honorary Curator of Ichthyology, American Museum.

Notes

MAJOR GENERAL WILLIAM CRAWFORD GORGAS, retired, surgeon general of the United States army during the four years of the World War, died in London on July 4, while en route to Africa to continue his fight against yellow fever. General Gorgas, born in 1854 in Mobile, Alabama, was the son of William Gorgas, a West Pointer and chief of ordnance of the Confederate army. He received his medical education at Bellevue Hospital Medical College (New York University), New York City. His fame as a physician rests primarily on his successful sanitary campaign against yellow fever, a work which he began in Havana in 1901 immediately after the discovery that the disease is transmitted by mosquitoes. During his lifetime General Gorgas was widely honored by universities and scientific societies and was knighted by King George of England shortly before his death.

THE following official telegram was received from California, August 4. It would give pleasure to the American Museum if its publication here might result in an increased support in membership for the work of the League.

TO THE EDITOR OF NATURAL HISTORY:

Save the Redwoods League receiving enthusiastic support throughout the United States. Object is to preserve by purchase or donation representative tracts of *Sequoia sempervirens* in primitive state. Cutting is already halted in several important tracts. League hopes to save a redwood national park, and a state park is urged along the state highway. In Mendocino, Humboldt, and Del Norte counties a redwood survey is projected to determine available areas. Smaller tracts on the highway will be preserved by establishment of memorial groves by organizations and individuals. Campaign of publicity for members and funds now going on. Membership increasing daily, over 3000 enrolled. All interested in preserving these magnificent and unique trees are invited to join the league and to use influence to secure other support from individuals and organizations. Annual membership fee is two dollars payable to R. G. Sproul, secretary-treasurer, 430 Library Building, University of California, Berkeley. Patron's fee is five hundred dollars.

(Signed) R. G. SPROUL,
Secretary of the Save the Redwoods League.

DR. JAMES R. ANGELL, chairman of the National Research Council and professor of psychology in the University of Chicago, has been elected president of the Carnegie Corporation of New York.

THE following engrossed felicitations have been presented to the Trustees of the Metropolitan Museum of Art, New York City, in recognition of the celebration of the fiftieth anniversary of that institution:

The Trustees of the American Museum of Natural History desire to extend to their fellow Trustees of the Metropolitan Museum of Art their cordial and fraternal felicitations on the occasion of the Golden Jubilee of the Metropolitan Museum of Art. This marks the completion of the first fifty years of idealism in direction and of unexampled generosity in contribution which in the brief period of a half century has placed our sister institution the foremost in America and among the foremost in the world. We look forward with confidence to the new half century of advance in all that art and beauty mean in their influence on American life, culture, and civilization.

THE noted American hunter and sportsman, Mr. Walter Winans, died suddenly in London on August 12 in his sixty-eighth year. Mr. Winans, although spending most of his life abroad, was a true American and a friend of the American Museum which he enriched with a number of specimens. He was a noted marksman, winning the revolver championship twelve consecutive times in England, the dueling pistol championship in Paris in 1909, and the world's championship with the hunting rifle at the Olympic Games in 1908 as a member of the American team. His gifts to the American Museum were the result of his skill with the rifle. The most noteworthy of these are the group of wild boars from the Black Forest, awaiting a place in the hall devoted to the life of Europe and Asia, and a series of pheasants, illustrating various phases in albinism. His last gift was a specimen of the Chillingham wild cattle, regarded as survivors of the native British oxen.

THE largest and most mysterious land animal known in the world today has been named *Baluchitherium osborni* by its discoverer, C. Forster Cooper, now curator in the University Museum of Zoölogy, Cambridge, England. The animal is like neither an elephant, nor a rhinoceros, nor a titanothere, nor a moropus. Mr. Cooper writes

that the ankle bone is certainly that of a perissodactyl and seems nearer to the rhinoceros than anything else. A giant primitive rhinoceros tooth, ten centimeters across, has been found, which indicates the presence of rhinoceroses of gigantic size in the Bugti beds of Baluchistan in Oligocene times, which was a strange faunal period.

The *Baluchitherium*, if a rhinoceros, certainly had a very long neck, more like that of a gigantic giraffe than that of a horse. Two of the anterior vertebræ of this monster have recently been received in the American Museum and have been compared with all our large land animals, living and extinct, with no result. These neck vertebræ dwarf those of all the largest land animals.

The Bugti beds, which have been explored by Cooper and by Pilgrim, also yield a hornless rhinoceros, *Paraceratherium*, in which the lower incisor teeth are turned downward; a hippopotamus that is typical except that it lacks front teeth; and a beautiful anthracothere called *Gelasmodon*. This gives us a glimpse into the still unknown mammalian life of southwest India.

DR. CLARK WISSLER, curator of anthropology in the American Museum, will be absent for one year beginning June 1. Dr. Wissler spent the month of June visiting the Pueblo ruin at Aztec, New Mexico, after which he went to Hawaii for two months where he will represent the American Museum at the Pan-Pacific Congress in August. Following this, Dr. Wissler will assume his duties as chairman of the Division of Anthropology and Psychology of the National Research Council in Washington.

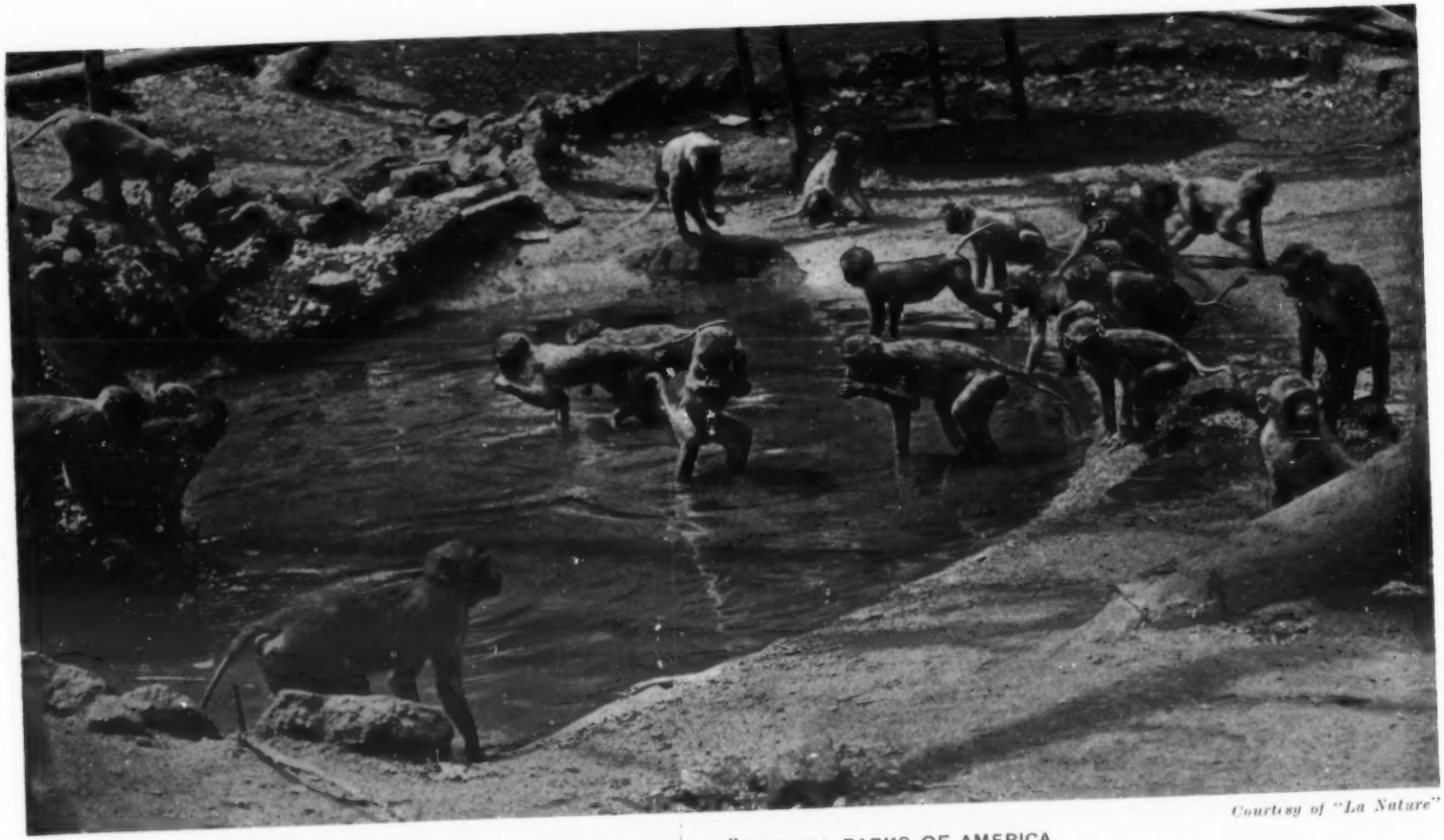
Dr. Wissler writes that while at Aztec he witnessed the excavation of the most remarkable room so far found in any cliff dwelling—"a sealed-up room in perfect condition. The interior is plastered and painted in a brilliant white with dull red side borders and a running series of triangular designs. No room approaching this in beauty and perfection has ever been discovered in America. It is the one great stroke of our work here. There are several adjoining rooms that seem to have some relation to this, but it will be some time before they can be dug out.

"What we have is obviously the holiest shrine of these prehistoric people. There is not much in it, all the sacred objects having been removed from the altar. But on the ceiling beams are imprints of hands made by rubbing white paint on the palms and fingers and then pressing down upon the beams. Several strands of beautifully made rope hang from the ceiling, presumably for the support of hanging objects. On the floor were a large number of nicely cut stone slabs. This room is one more suggestion that the people who lived in the cliff houses were the founders of the culture at Aztec and Bonita. Thus we may assume that the people who lived in Aztec were forerunners of the living Pueblo Indians in the same way that the cliff dwellers preceded them."

THE genesis of the peculiar sacred rooms or kivas of the cliff dwellers, as pointed out by Dr. J. Walter Fewkes, chief of the Bureau of American Ethnology, in an address before the Anthropological Society of Washington, has been discovered through excavations in the Mesa Verde National Park, Colorado. This type of room is prehistoric and now extinct, but the record of its evolution is still to be found within the limits of Mesa Verde. The most primitive prototype of the kiva is an earth lodge fitted with bins made of stone slabs set on edge. Between this rude lodge and the fine multiple unit type of kiva of regular horizontal masonry are to be found a complete series of lodges in ascending stages of development.

THE employment of monkeys as coconut pickers has often been described. The former curator of museums at Sarawak, Borneo, affirms that the Bornean natives train *Macacus nemestrinus* for this work. The monkey, tied to a cord, climbs a coconut tree, and twists off the ripe nuts in response to shouts from his master below. An authority in Sumatra confirms this account, adding the fact that the monkeys have considerable commercial value as laborers. Trained animals bring from $8 to $20 a head. The monkeys used are large and usually remain very savage.

The Natural History of South Africa, by F. W. Fitzsimons, director of the Port Elizabeth Museum, is addressed to the general public of South Africa, including the school children. The work, two of the four volumes of which have appeared, is of wider interest, however, for all who delight in reading of the habits of the wild folk of forest and field will find here fascinating descriptions



Courtesy of "La Nature"

A SUGGESTION FOR THE ZOÖLOGICAL PARKS OF AMERICA

The rejuvenating effect of open space, fresh air, and running water on a collection of caged monkeys has been demonstrated at the Zoölogical Garden, Regent's Park, London, where a new, huge monkey house was designed to reproduce a corner of the jungle with trees, grass, and a lake, fed by a small stream. The joyous surprise of the monkey-folk on experiencing this change from close confinement may well be imagined, but, what is equally important, their behavior under natural conditions may now be observed by the visitors to the Park. One monkey habit, at least of this London group, is illustrated in the above picture where the animals may be seen drinking from the bowled left hand. It is to be hoped that the practice of erecting outdoor habitats may be adopted by all other zoölogical gardens where the conditions will in any way allow

from Mr. Fitzsimons' long personal experience with the animals of the Union. He devotes considerable space to the Primates, giving the concluding history of "Jack," the baboon who acted as signalman on the railway, whose feats Mr. Fitzsimons previously chronicled in his *Monkey Folk of South Africa*. The volumes are well illustrated with photographs of both the animals and their habitats.

SIX scholarships for advanced study and research at American universities have been arranged for by the Imperial College of Science and Technology, London. Viscount Grey, lately British Ambassador to the United States, writes in this connection: "It is most desirable that young men of the rising generation, who will do much of the public work here and in America in the coming years, should get to know each other's universities. It will help both countries to realise how much the British and American peoples have in common, not merely in language, but in thought and in political views and aspirations."

THE scientific work of the Smithsonian Institution for 1919 included many important explorations and field researches by members of the staff. Dr. Charles D. Walcott, secretary of the institution, continued his studies of the Upper Cambrian formations of the Canadian Rockies. An expedition was made to La Paz, Bolivia, in the interests of the astrophysical observatory, and successful photographs were taken of the total eclipse of the sun on May 29. Zoölogical collecting was pursued in Australia, French Congo, and Santo Domingo, and Dr. Paul Bartsch continued his experiments on marine invertebrates on the Florida Keys. A survey was undertaken of the vegetation of Glacier National Park, Montana, to serve as a basis for a popular account of the flora by the National Parks Association. In the fields of archæology and anthropology the institution continued the excavation and repair of the cliff dwellings in Mesa Verde National Park, Colorado, and made other excavations in Arizona and Utah. Extensive field work was also carried on among the living Indian tribes.

THE director of the United States Bureau of Mines, Dr. Van H. Manning, resigned on June 1 to accept the directorship of research for the American Petroleum Institute. In his letter of resignation to the President Dr. Manning wrote as follows: "In leaving the government service there comes to me, as it has over and over again, the thought that although this government spends each year many millions of dollars in useful scientific work for the benefit of the whole people, the monetary recognition of its scientific and technical servants is not sufficient to enable them to continue in the service for the people. This has been especially true within the last few years when it has been impossible for many men to remain in the government service."

THE salvaging of food fishes left stranded by the Mississippi River during its periodic floods, has proved one of the important functions of the United States Bureau of Fisheries.[1] When the river overflows, the adult fishes seek the quiet back waters to deposit their eggs. These are hatched in favorable places, but when the river again subsides, a large proportion of the young fishes are left land-locked in small lakes that will soon dry out by evaporation and seepage. These are rescued by the simple process of netting and depositing them in the open river. The work last year salvaged more than 150,000,000 food fishes. Assuming that 25 per cent of the rescued fishes survive and attain a marketable size, the bureau estimates their prospective value at about $6,500,000.

DR. AUGUSTUS TROWBRIDGE, professor of physics in Princeton University, has been granted a leave of absence in order that he may assume the chairmanship of the Division of Astronomy, Mathematics, and Physics, of the National Research Council, Washington.

THE National Research Council has appointed a committee on eugenics under the chairmanship of Dr. C. B. Davenport, director of the Biological Laboratory of the Brooklyn Institute of Arts and Sciences. This committee is arranging for the Second International Eugenics Congress which will be held in New York City on September

[1] "Fish Reclamation." *Bulletin of the American Game Protective Association*, Vol. IX, 1920, p. 11; Hugh M. Smith, "When the Father of Waters Goes on a Rampage." *National Geographic Magazine*, April, 1920, p. 369.

22–28, 1921. Officers of the congress were elected as follows: Dr. Alexander Graham Bell, honorary president; Professor Henry Fairfield Osborn, president; Mr. Madison Grant, treasurer; Mrs. Sybil Gotto, honorary secretary.

Dr. Ferdinand Broili has been appointed professor of geology and palæontology in the University of Munich to succeed Professor A. Rothpletz. Dr. Broili was a student of Professor Karl von Zittel and reviser of the latter's famous *Grundzüge der Paläontologie*.

For the purpose of investigating all proposed state memorials to Theodore Roosevelt, a bill was passed at the last session of the New York State Legislature and was signed by the Governor, creating a commission of six members, two to be appointed by the Senate, two by the Assembly, and two by the Governor. The commission is to act without compensation (other than its actual and necessary expenses, for which an appropriation of $1000 was made), and to report to the Legislature and Governor on or before January 1, 1921.

To carry out the provisions of the bill, the Speaker of the Assembly has appointed Messrs. Louis A. Cuvillier, of New York, and Raymond T. Kenyon, of Ausable Falls; Governor Smith has appointed Mr. Peter D. Kiernan, of Albany, and Professor Henry Fairfield Osborn, of New York.

Mr. James M. Macoun, systematic botanist and the chief of the biological division of the Geological Survey of Canada, also at one time attached to the fur-seal investigations of Bering Sea, died in May at the age of 58 years. Mr. Macoun's father was also a naturalist of the Survey and the two contributed more than 100,000 specimens to the National Herbarium.

The naturalist, Dr. F. E. Blaauw, of Holland, who has just returned from a study of the forests of *Araucaria*, a tree of ancient lineage still surviving in Chile, affirms that he has not seen in his extensive travels in South America or elsewhere forests comparable with the redwoods of northern California—especially the assemblage of giant trees in the Bull Creek forest. Through the work of the Save the Redwoods League in the period of delayed action by Congress the reservation of large tracts of redwoods is taking on international interest and importance.

Dr. John C. Merriam, the new president of the Carnegie Institute (see page 253), has been connected officially with the work of the Save the Redwoods League from its inception; he has been the executive head since June, 1920. The following paragraph quoted from Professor Henry Fairfield Osborn not only includes an encomium on the work of such public-spirited citizens and men of science as Dr. Merriam, but also sets forth the unanswerable argument for the reservation of the redwood forests, for leaving our national parks without industrial encroachment, and for devoting all governmental reservations in all parts of the country to recreational purposes:

> The leaders in great conservation movements in all parts of the United States and the men who are fighting hardest to protect and preserve what has already been won are those who have faith in the higher attributes of our human nature and believe that these attributes should be preserved at all costs and if necessary at any commercial or economic sacrifice. But so closely are the spiritual, the moral, and the physical interrelated in man that the conservation of the spirit and of the intellect is also guaranteed by the perpetuation of our physical well-being. Anyone who has observed the continuous stream of travel from the torrid cornfields of Nebraska and Kansas, or from the sweltering arid valleys of the California wheat belt, into the cool retreats of the great Yellowstone National Park or into the glories of the Yosemite and the Sierras, will not hesitate for long in the realization that in saving the wondrous redwood belt of northern California we are also saving the very best spiritual and moral forces of the people.

Dr. Carlos Ameghino has been appointed director of the National Museum of Natural History, Buenos Aires. Dr. Ameghino explored Patagonia many years ago, and made the collection of fossil vertebrates described by his brother, Dr. Florentino Ameghino, a distinguished palæontologist, who also was director of the National Museum from 1902 until his death in 1911. An official edition of the complete works and scientific correspondence of Dr. Florentino Ameghino is being published in La Plata by the minister of public works of the Province of Buenos

Aires. The editor, Sr. Alfredo J. Torcelli, requests everyone who has received scientific correspondence from Dr. Ameghino to send him copies of the letters in order that they may be included in the collection. Two of the volumes have already appeared.

THE Ecological Society of America, a co-operative organization comprising zoölogists, botanists, foresters, agriculturists, climatologists, and geographers, has inaugurated a new journal to be known as *Ecology*. For this purpose the society took over the magazine *Plant World* which it will continue under the new name and policy. Mr. Barrington Moore, president of the society, will serve as editor-in-chief.

A MEMORIAL meeting in honor of the late Dr. Abraham Jacobi was held by the New York Academy of Medicine on May 6, his ninetieth birthday anniversary. Mr. George McAneny, executive manager of the *New York Times*, presented the academy with a bas-relief of Dr. Jacobi. The address of the occasion was delivered by Dr. George E. Vincent, president of the Rockefeller Foundation.

DR. W. W. KEEN has been elected an honorary fellow of the Royal Society of Medicine (London) and of the American Surgical Association.

THE cost of publication of scientific periodicals and reports of learned societies is a serious problem in this country and bids fair to become disastrous in Europe. A leading editorial in the British weekly, *Nature*, appeals for government aid and endowment for the purely scientific papers. Increase of the circulation of such magazines is practically impossible and the incomes of scientific workers have already so decreased relatively that they cannot afford to pay an increased price. "Plutocrats will pay high prices for the pictures they want, and popular authors and musical composers may amass riches from royalties on their works; but the science worker is deprived of any such rewards for his discoveries, although all the world may benefit by them. Not only does he bring his rich argosies into port, but he also describes his cargoes fully, and *himself pays for the publication* of the catalogue of gifts which he is prepared to bestow freely upon all who care to receive them. . . . Altered circumstances, however, make it necessary to reconsider this position, and we urge that it is time the community, through its rich citizens or the Government, provide reasonable contributions toward the expenses of publications which bring honour to them as well as add to the sum of human knowledge."

SOME months ago Mr. Walter R. Shaw, of the University of the Philippines, writing in *Science*, pointed out the danger attendant upon open-air swimming, because of the same optical illusion that causes us to experience a sensation of moving backward when a train we are in is passed by one of swifter motion going in the same direction. Mr. Shaw has observed that a person swimming with the wind, and consequently with the waves, which travel much faster than he possibly can swim, receives the impression of being carried backward in the water. This often leads an inexperienced swimmer to believe that he is caught in the "undertow." In his panic he overexerts himself, with the result that he may become exhausted before he can reach a footing. When our schools and colleges give publicity to this optical illusion in courses dealing with physics, physiology, and physical culture, and teach the wisdom of choosing some fixed object by which to gauge progress, the danger will be lessened.

PENDING the publication of an extensive article in NATURAL HISTORY describing the work of the American Museum's Second Asiatic Expedition to North China and Mongolia, Mr. Roy Chapman Andrews gives the following notes regarding the material which was obtained and placed on exhibition in the Museum:

The work was in especial reference to the proposed hall of Asiatic life of the Museum and the installation of certain groups representing the fauna of Asia. Chief among these groups is a splendid series of bighorn sheep, the argali, of Mongolia. Seven specimens, which represent a world's record for this species, show the horn growth from its beginning in the year-old animal to its culmination in the magnificent ram. Only a few bighorn sheep remain in China, and these will undoubtedly soon be ex-

terminated when the railroad is extended from Feng-chen to within six miles of their haunts and Peking and Tientsin sportsmen flock to these hunting grounds. The expedition collected also an interesting species of Asiatic wapiti or elk. It is estimated that probably not more than from fifty to sixty animals of this species remain.

In Mongolia splendid group material representing the antelope and marmot of the plains and the roebuck of the forests was obtained, also specimens of wapiti, musk deer, wild boar, and other animals from the Urga region. Urga is an especially advantageous base for collection work; it lies at the point of junction of the Central Asiatic life zone on the south and the Siberian zone on the north. Within a very few miles in either direction from Urga the collector can find two totally different faunas. The forests consist of large pine, spruce, birch, willow, and alder, and the birds as well as the mammals are typically Siberian. The ptarmigan, capercaillie, and hazel grouse are among the most distinctive birds, and the great variety of voles (*Microtus*), squirrels, chipmunks, weasels, wolverines, and martins indicates the northern character of the fauna. The plains fauna include such distinctive species as the antelope, marmot, pole cat, wolf, hamster, vole, and kangaroo rat.

After returning from Mongolia at the beginning of October, work was conducted in northern Shansi Province, twenty miles from the southern Mongolia frontier. Here sheep, wapiti, roebuck, and goral, besides a considerable series of small mammals, were obtained. In early December especially efforts were made to obtain a series of wild boar in the Shansi Province. Four fine animals were collected altogether, with other species new to the Museum's collections. During the seven months of actual field work about 1300 animals were obtained, most of them from localities which had hitherto not been visited by naturalists.

THE cat-tail (*Typha*) has been experimentally investigated as a possible source of food supply by Professor P. W. Claassen, of Cornell University.[1] The root stalks or underground stems (rhizomes) of this common swamp plant were known as a source of nutritious sweet flour to some of the eastern Indians, but although the white man quickly learned from them the value of maize and potatoes, they completely ignored the cat-tail. The rhizomes are perennial storage reservoirs of starch which can be ground into a very palatable flour. Examination by the Plant Chemical Laboratory at Washington showed 81.41 per cent carbohydrates and 7.75 per cent protein. This approximates the protein content of rice and corn flours. The laboratory reported that cat-tail flour can be used to the extent of from 10 to 20 per cent as part substitute for wheat flour. Professor Claassen calculated that an acre of cat-tails would yield considerably more than two tons of flour, and there are thousands of acres of cat-tail marshes in the country which annually could produce thousands of tons of this nutritious food.

[1] *Scientific Monthly*, Vol. IX, 1919, p. 179 ff.

THE transplantation of sea anemones by a hermit crab when the latter moved from

Courtesy of Susan B. Dinsmore, Mesa, Arizona

This photograph of "James, with Bobbie," a rescued young robin, appeared in *Bird-Lore* for May–June, 1919. It is a pleasure to present James to the readers of NATURAL HISTORY. His face assures us that the fact that "Grandpa's bean crop was saved while a neighbor's was eaten up by bugs" was not the young robin's greatest work—and that *economic* value is not our strongest plea for protection of our native birds

one mollusk shell into another is recorded in a communication to the National Academy of Sciences. The observations were made by Dr. R. P. Cowles in the laboratory of Johns Hopkins University. The crab which inhabited a shell bearing three anemones was presented with a clean *Dolium* shell larger than the one in use. It moved into the new shell and then immediately proceeded to pull off the anemones from its old home with its pincers. After considerable rough handling these delicate animals were all three removed, without injury, to the new shell to which they attached themselves. One of the anemones, instead of contracting as it regularly does if disturbed, remained expanded throughout the mauling. It is supposed that the hermit crab derives some advantage from the presence of anemones in the probable protection afforded by their stinging cells against fishes that would prey upon it.

THE Smith Yellowstone Park Bill failed of passage in the late session of Congress, but was not defeated and will come up again in the December session. It would permit the building of reservoirs in Yellowstone National Park to supply certain Idaho farms during occasional dry seasons. If the measure should ever pass, two enormous reservoirs would submerge the thicket and forest land of the southwest corner of the park where are situated the home and last stand of the Yellowstone moose. Further, the bill is an innocent-looking attempt to establish a precedent under cover of which attacks can be made on Yellowstone Lake, and probably other parks. The National Parks Association and other organizations and individuals rallied to the defense of the public property and succeeded in putting off the difficulty for a time, but in the next Congress Montana also will probably be prepared to support a similar attack. All friends of the national parks must undertake a regular task of educating both Congressmen and their constituents in the value and necessity of preserving our national parks from all commercial encroachments.

THE New York Botanical Garden has acquired two collections of plants from the Big Cypress Swamp of Florida. One of these consists of the medicinal plants known to the Seminole Indians who lived in and about the swamp. It is the first collection of its kind ever brought together.

A PERMANENT exhibition of sugar substitutes has been installed in the Philadelphia Commercial Museum. There are glucose, honey, maple sugar, milk sugar, and saccharine—the last the coal-tar derivative which is five hundred times as sweet as cane sugar. There is sorghum molasses from our southern states, and various foreign sugars are included, such as barley sugar from Japan, palm sugar from the East Indies, and palm sirup from Peru. Also there are special sirups for use in confectionery, soft drinks, medicines, bread and pastry (where sirup is substituted for yeast), and even for dissolving starch in the laundry.

PROFESSOR T. D. A. COCKERELL, of the University of Colorado, has been elected an honorary fellow of the American Museum in recognition of his distinguished services to science.

THE department of geology of the American Museum has in preparation a series of relief models representing topographic and geologic features of selected areas. The models now in progress are representations of the Mount Washington region of New Hampshire, the Mount Tom–Mount Holyoke range region in Massachusetts, the Watkins Glen region in central New York, the sink-hole region of the Standing Stone district in eastern Tennessee, and the Porto Rico and Virgin Islands region with their surrounding sea bottom.

THE department of anthropology of the American Museum has received a collection of dancing costumes, everyday apparel, ornaments, and household utensils from western Tibet. The collection was presented by Mr. J. P. Morgan, trustee of the Museum, and was collected by Dr. H. B. Marx, of Nazareth, Pennsylvania, a medical missionary who has spent sixteen years in Tibet.

A COLLECTION of 3200 land birds collected in the West Indies and South America by Mr. Rollo H. Beck, has been presented to the American Museum by Mr. Frederick F. Brewster. The collection includes many

birds from the high mountains of Santo Domingo, about five hundred from Bahia, Brazil, and a representative series from Tierra del Fuego and the Falkland Islands. The accession is unusually rich in species rare to museum collections and contains the type of a new genus of goatsuckers.

Dr. Henry E. Crampton, curator of invertebrate zoölogy in the American Museum and professor of zoölogy in Columbia University, left New York City in May on an expedition to southern Asia and Oceania. He will stop at Guam and several of the Ladrone Islands, the Philippines, and Hongkong. He will then proceed by way of southern China to Singapore, Bangkok, and the interior of Siam. Subsequently he will visit the Dutch East Indies and return to the United States by way of Australia and New Zealand. This is Dr. Crampton's eleventh tropical expedition. It is conducted with the coöperation of the Bishop Museum of Honolulu and the National Geographic Society of Washington and is financed in part through contributions from friends.

Dr. Frank E. Lutz, associate curator of invertebrate zoölogy in the American Museum, left New York the middle of June on the third of a series of expeditions for the study of insect distribution in the Rocky Mountain region. The first of these journeys was made to Arizona and the second through Colorado (described by Dr. Lutz in the present number of Natural History, on pages 312–325). This summer Dr. Lutz is collecting in southern and western Wyoming, southwestern Montana, the northern Salt Lake Valley, Utah, and at Tennessee Pass, Pueblo, and Lamar, Colorado.

The department of invertebrate zoölogy in the American Museum has installed in the Darwin Hall a group representing the sea animals and plants to be found within an area of two square inches of shallow sea bottom. The group represents the life in this area magnified twenty-five diameters (more than 15,000 times), and emphasizes particularly the incrustations composed of the minute Bryozoa or moss animals commonly found on shells, stones, and seaweed. Seven species of these are given. Other forms associated with these include microscopic hydroids in the act of budding off tiny medusæ or jellyfishes, certain Protozoa, a sea spider, and a colony of ascidians undergoing metamorphosis. The group occupies one of the window spaces, through which the light is infiltrated by means of a succession of transparent backgrounds painted on plate glass. On the front of the case is modeled a huge magnifying glass forty inches in diameter through which the visitor looks to view the group. Framing the magnifier is a transparency colored to represent in natural size the portion of the sea bottom from which the two-inch area was selected. The modeling in the group was done in glass, wax, celluloid, and plaster by Messrs. Herman Mueller, Chris E. Olsen, and Show Shimotori of the American Museum preparation staff. The group was designed by Mr. Roy W. Miner, associate curator of invertebrate zoölogy, and prepared under his direction.

Five thousand reprints of "Sequoia—the Auld Lang Syne of Trees," by Professor Henry Fairfield Osborn, the article on the California redwoods published in Natural History for December, 1919, have been presented to the Save the Redwoods League by the author. They will be used as campaign matter especially in the West to increase knowledge of the forests of giant redwoods along the Pacific slope of the Coast Range.

One of the activities of the American Museum during the World War was the preparation of plans of what is designed to be an ideal field hospital, portable, open on all sides in summer, embodying the latest experience from Great Britain and France. The work was done at the Museum under the direction of President Henry Fairfield Osborn, by Chief of Construction H. F. Beers. A large working model was exhibited in New York and San Francisco. The trustees of the Museum are now presenting all the working plans and models to the School of Hygiene and Public Health of Johns Hopkins University, Maryland, an institution of which the distinguished pathologist, Dr. William H. Welch, is director. On July 31, Dr. Welch acknowledged receipt of the plans as an interesting addition to the museum collection of the School of Hygiene.

Fifty posters designed by children of New York City grade schools to promote the

teaching of kindness to animals were displayed in the American Museum in May and attracted unusual attention. They represented a competition carried out under the auspices of the New York Women's League for Animals.

MR. ROY W. MINER and Dr. E. O. Hovey represented the American Museum of Natural History at the fifteenth annual meeting of the American Association of Museums, held in Washington May 17–18. Mr. Miner's term as councilor had expired and Dr. Hovey was elected councilor. Papers were read on "Microscopic Animals in Museum Groups" by Mr. Miner, on "Museum Coöperation" by Dr. Hovey, and on "Mounting Geological Specimens with Sulphur" by Dr. Hovey for Dr. Chester A. Reeds, associate curator of invertebrate palæontology in the American Museum.

MR. LESLIE SPIER, assistant in anthropology in the American Museum, has been appointed associate curator for 1920–21 of the Museum of the Department of Anthropology in the University of California.

MR. H. E. ANTHONY, associate curator of mammals in the American Museum, and Mr. George K. Cherrie, noted field naturalist, sailed on June 18 for southern Ecuador. The expedition is in continuation of the biological survey of South America inaugurated in 1911 by Dr. Frank M. Chapman.

ENSIGN WILLIAM S. FLOWER, grandson of a great former director of the British Museum, Sir William Flower, visited the American Museum recently. His father, Capt. Stanley S. Flower, is director of the Giza Zoölogical Gardens near Cairo. Ensign Flower writes from Cairo a gratifying letter regarding preservation of birds:

> Lord Kitchener's bird protection laws of 1912 have resulted in an increase of cattle egrets from a few pairs to 25,000 birds bred in these gardens. They are almost entirely insectivorous and very useful to farmers. Some go as far as twenty to thirty miles every day, while the whole colony returns at night. The Egyptian hoopoo, which was once very rare, can be seen any time of the day in the gardens and I've counted as many as eight together, while several come within a few feet of us on the verandah.

THE library of the American Museum has continual inquiry for back numbers of the AMERICAN MUSEUM JOURNAL and NATURAL HISTORY, and urges that those subscribers who have copies which are not further needed will send them to the Librarian. They may be sent by express, collect.

SINCE the last issue of NATURAL HISTORY the following persons have been elected members of the Museum:

Patron, AUGUST HECKSCHER.

Honorary Fellow, PROFESSOR T. D. A. COCKERELL.

Life Members, MRS. WILLIAM RANDOLPH HEARST, MISS ANNIE M. ALEXANDER, MESSRS. JOSEPH AINSLIE BEAR, SAMUEL BIRD, and ARNOLD F. RIEGGER.

Sustaining Members, MESDAMES HAZEL DORIS CARTIER, COLEMAN DU PONT, JOHN T. PRATT, MESSRS. LOUIS PIERRE CARTIER, and W. I. WALTER.

Annual Members, MESDAMES ADDISON BROWN, M. LE BRUN COOPER, W. H. EBBITT, CARL FERENBACH, WORTHAM JAMES, BARENT LEFFERTS, A. ROGERS-JENKINS, MISS A. LAGEMANN, COUNT GUILLAUME DE GRUNNE, DOCTORS F. ELMER JOHNSON, ELLICE MCDONALD, MESSRS. DANIEL D. ADEE, JEROME C. ADLER, JOHN J. AMORY, KIMBALL C. ATWOOD, WILLIAM W. BAINBRIDGE, SAMUEL H. BIJUR, MARTIN BIRNBAUM, ARTHUR N. COOLEY, JOHN GEROW DUTCHER, MARMONT EDSON, GEO. W. FREEMAN, CHAS. A. FULLE, AARON GARFUNKEL, G. H. GOSSLER, F. W. HUMPHREYS, GILBERT H. JOHNSON, OTTO KAFKA, W. B. KIBBEE, GEO. W. KNOBLAUCH, J. M. R. LYETH, GILBERT S. MCCLINTOCK, NATHAN J. MILLER, WILLIAM B. NICHOLS, CLARENCE M. RYAN, DANIEL SMILEY, ARTHUR S. SOMERS, GERARD SWOPE, HUGO WEIGERT, RICHARD WHITNEY, MASTER AGNEW ALLEN TALCOTT, and THE UNIVERSITY SOCIETY.

Associate Members, MRS. LAURA G. BARTELS, MISS RUTH W. NEWCOMB, JUDGE FREDERICK W. HENSHAW, DOCTORS WINTERTON C. CURTIS, WILLIAM W. GRAVES, MESSRS. WM. L. DOBBIN, EDMUND B. FLADUNG, RONALD A. FOSTER, EDWIN FOWLER, N. B. PENDERGAST, RALPH M. REAHARD, CLARENCE SNIDER, HARRY S. SWARTH, and MASTER WILLIAM APPLETON AIKEN.